

Service Manual

**Technical
Description and
Service Instructions**

for

ELECTRONIC ENDOFLATOR® MODEL 26 4305 20 MODEL 26 4305 20-1

Order No. SV3347

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0. General

Thank you for your expression of confidence in the KARL STORZ brand name. Like all of our other products, this product is the result of years of experience and great care in manufacture. You and your organization have decided in favor of a modern, high-quality piece of equipment from KARL STORZ.

KARL STORZ instruments and equipment are for use only by qualified medical personnel who are trained in their use. All electrical installations at the location of use should meet applicable national and local electrical codes.

Refer servicing to duly authorized KARL STORZ service personnel. Always use genuine replacement parts from KARL STORZ. To determine which replacement parts are required please refer to the enclosed replacement parts list. Repair and calibration of this device requires special tools and gauges; certain internal adjustments must not be altered.

For further information, please consult this service manual or contact:

*KARL STORZ GmbH & Co. KG
Mittelstrasse 8, 78532 Tuttlingen
PO Box 230, 78503 Tuttlingen
Germany
Phone: +49 (0)7461 708-980
Fax: +49 (0)7461 708-404
E-Mail: technicalsupport@karlstorz.de
Web: www.karlstorz.com*

*KARL STORZ Endoscopy-America, Inc.
2151 East Grand Avenue
El Segundo, CA 90245-5017
USA
Phone: +1 424 218-8100
+1 800 421-0837
Fax: +1 424 218-8526*

Warranty

All KARL STORZ instruments and equipment are warranted to be free from defects in workmanship and materials for **two (2) years** from date of sale, unless otherwise specified; any instruments or equipment with such defects during the applicable warranty period will be promptly repaired or replaced at no charge to the customer.

KARL STORZ shall not be liable, expressly or implicitly, for:

- Any damages which might arise or be caused, whether by the customer or by any of the users of the instrument or equipment, as a result of:
 - misuse, mishandling, and/or improper operation,
 - repairs, modifications and/or alterations performed other than by KARL STORZ or a KARL STORZ authorized repair facility, or
 - use in combination with adaptors and/or equipment, or use in any manner or medical procedure, other than those for which it is designed; and
- Any special, indirect and/or consequential damages of any kind and however caused arising from the sale or use of the instrument and/or equipment.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, AND/OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY, FITNESS, AND/OR OF SUITABILITY FOR A PARTICULAR PURPOSE, AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON KARL STORZ'S PART.

KARL STORZ neither assumes nor authorizes any person to assume for it any other liabilities in connection with the sale of said instrument and equipment. To ensure proper use, handling, and care of instruments and equipment, consult the applicable product literature, catalog, brochure, instruction manual, teaching film and other materials which are included with the product and/or otherwise available from KARL STORZ, at no charge, upon request.

Maintenance and Repair

KARL STORZ recommends that all equipment be checked and inspected once a year by KARL STORZ, or by an authorized agent. All services such as modifications, repairs, calibrations, and/or readjustments may only be performed by KARL STORZ or by an authorized agent.



CAUTION: *Repairs may only be performed by qualified technicians trained in electrical or electronic engineering, in compliance with the relevant occupational, safety and accident prevention regulations.*

Always unplug the equipment before performing any repairs.

Safety Testing based on IEC EN62353, IEC / UL 60601-1, whichever may apply, must be performed after servicing has been completed.

By making the enclosed technical information available, KARL STORZ does not authorize any service or repair by unauthorized service personnel. Tampering with the instruments or equipment, or unauthorized service or repair of the device nullifies and voids the warranty.

Reservation of Rights

This documentation is the sole and exclusive property of KARL STORZ and may neither be copied nor passed on to third parties without the express written authorization and approval of KARL STORZ.

KARL STORZ reserves the right to make engineering modifications in the interest of promoting technological progress and generating performance improvements without obligation on the part of KARL STORZ to submit prior notice thereof.

Section 1.

Instruction Manual

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Section 2.

Physical Design

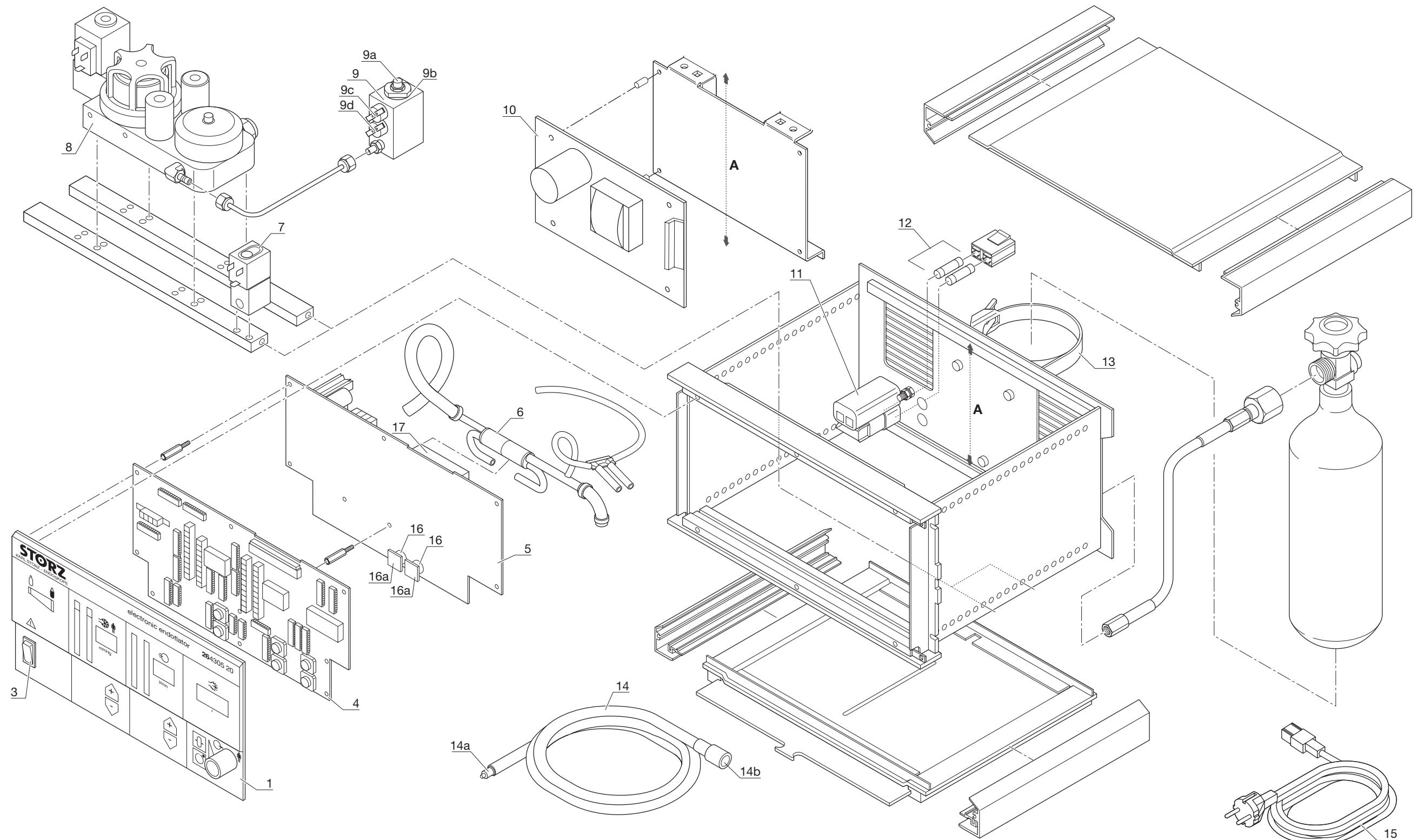
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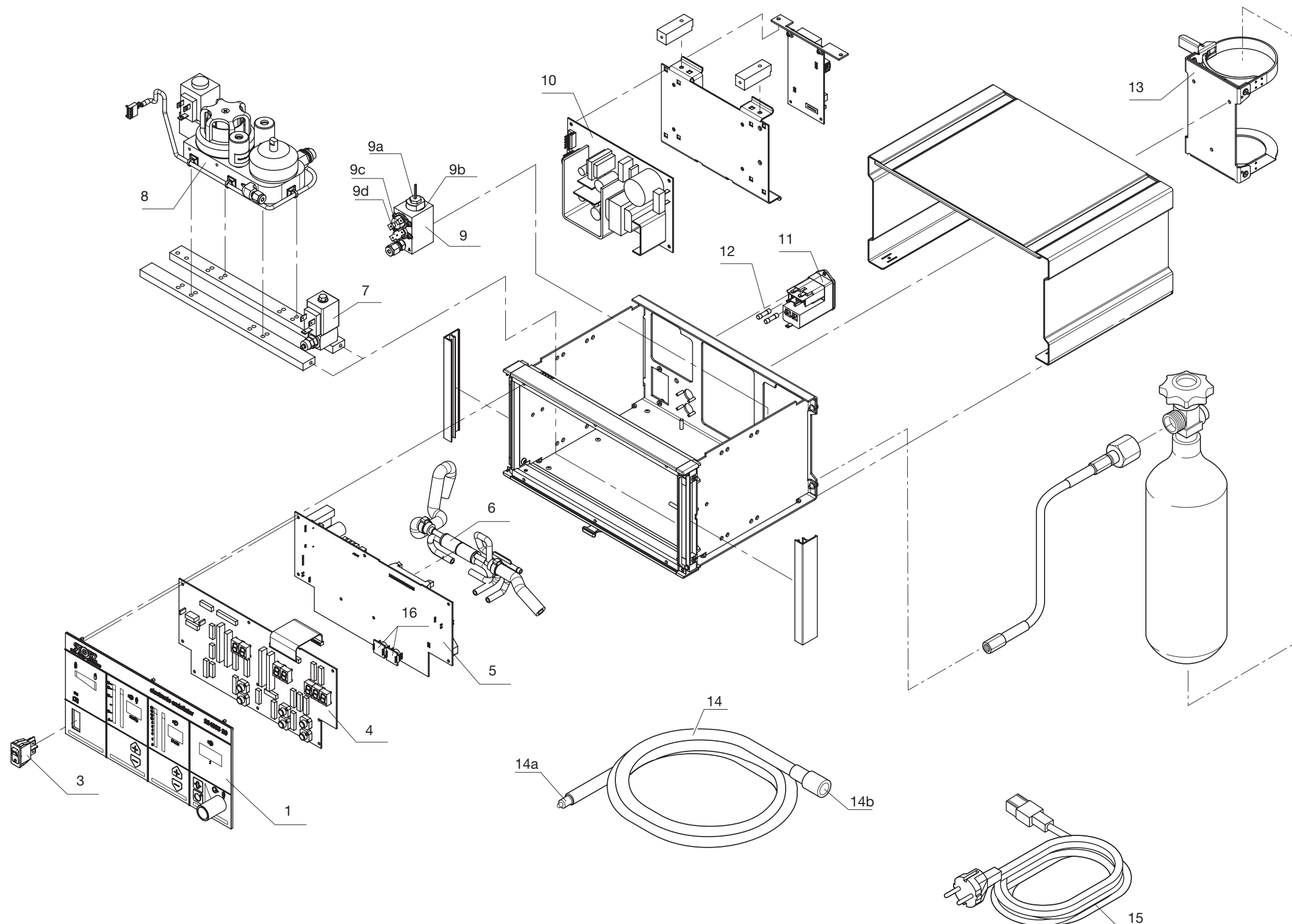
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2.1 Exploded view of the ELECTRONIC ENDOFLATOR® with standard housing



2.2 Exploded view of the ELECTRONIC ENDOFLATOR® with new system housing



2.3 Spare parts of the ELECTRONIC ENDOFLATOR®

Position	Item description	Order no.
1	Front panel	26 4305 85
3	Power switch	20 0112 80
4	Display board	26 4305 83
5	Control board	26 4305 84
6	Gas flow splitter with connected tubing set	26 4305 81
7	Blow off valve	20 0120 80
8	Pressure manifold with high pressure transducer and solenoid valve connected	26 4305 80
9	Gas preheater, complete	A016-305
9a	Heating cartridge	20 0122 80
9b	Sealing fluid, thermal resistance up to 200 °C (392 °F)	5903550
9c	Temperature limiter	49600000001
9d	Temperature regulator	49600000002
10	Power supply unit, 60 W	20 0102 82
11	Line plug with line filter	20 0115 80
12	Power fuses 2 x T 2.0 AL / 250 V	20 2759 0
13	Bottle stand	20 4000 31
14	Silicone tubing set	20 4001 43
14a	LUER lock tube connector to silicone tubing set 204000 43 / 204001 43 for connection to Veress cannula, 10 mm cone	20 3001 84
14b	Plastic tube connector	20 4000 81
15	Power cord (grounded)	400A
	Power cord "hospital grade" (USA)	400B
16	Pressure sensor (patient pressure, ...)	20 0109 80
16a	Board for pressure sensor, equipped	45413004L00
17	Flow sensor (control board)	20 0108 80
–	High pressure in-line gas filter	20 4000 32
–	Seal CO ₂ high pressure tube / CO ₂ bottle (German connection)	2903490
–	Seal CO ₂ high pressure tube / CO ₂ bottle (pin-index connection)	2903390
–	KARL STORZ-SCB® upgrade kit	26 4305 77
–	Software update set (includes the latest software version)	26 4305 75-V02
–	Utility line	A016-507

Important note:

When ordering replacement parts always provide the following data

Item description

Order no.

Section 3.

Descriptions of Operation and Circuit Diagrams

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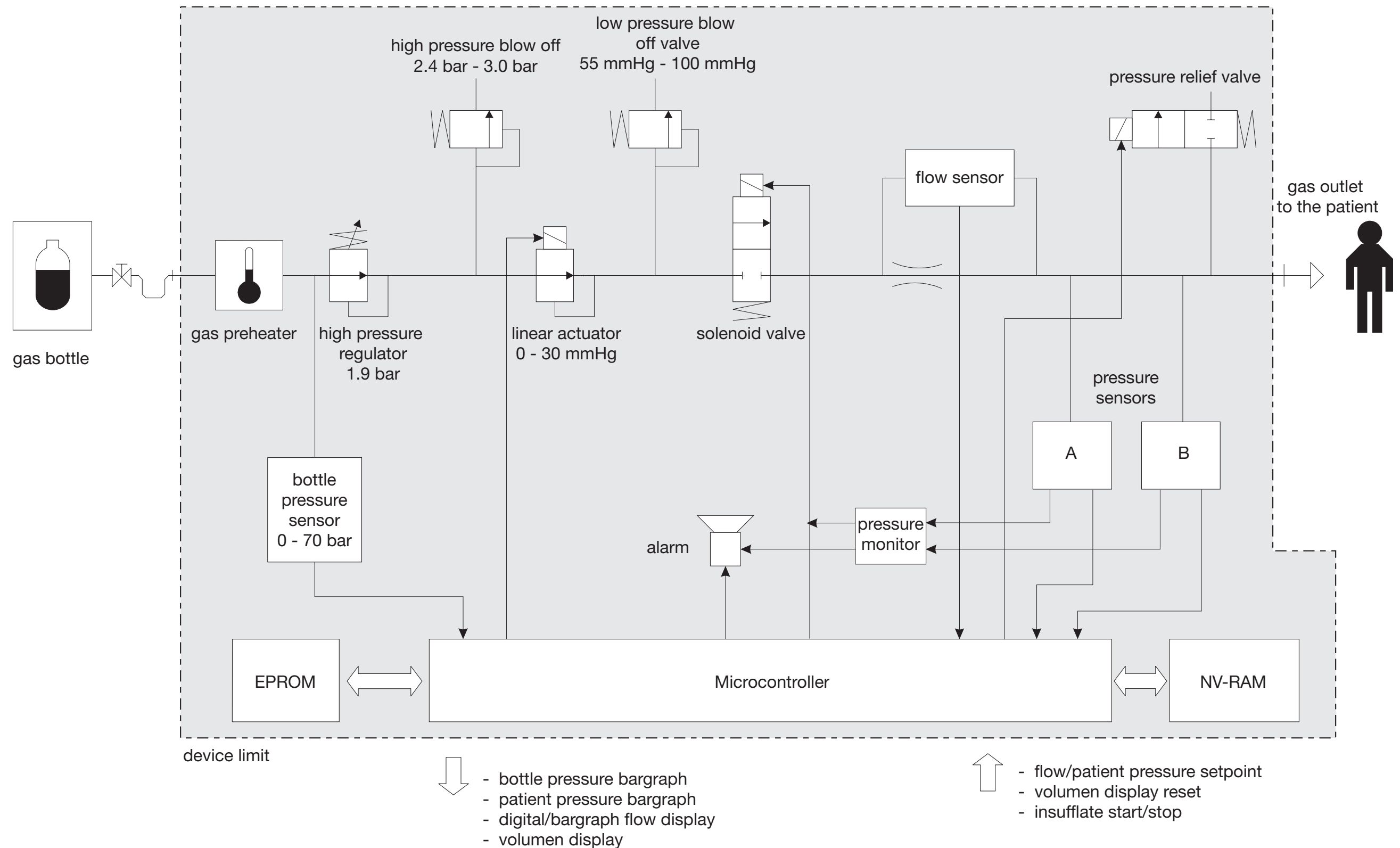
3.1 Description of ELECTRONIC ENDOFLATOR® operation

The ELECTRONIC ENDOFLATOR® 26 4305 20 / 26 4305 20-1 enables μ P-controlled CO₂ insufflation into the patient's body, allowing the user to work with a very high flow rate of up to 20 l/min. It also supports new operating techniques in which, for example, gas suction is employed.

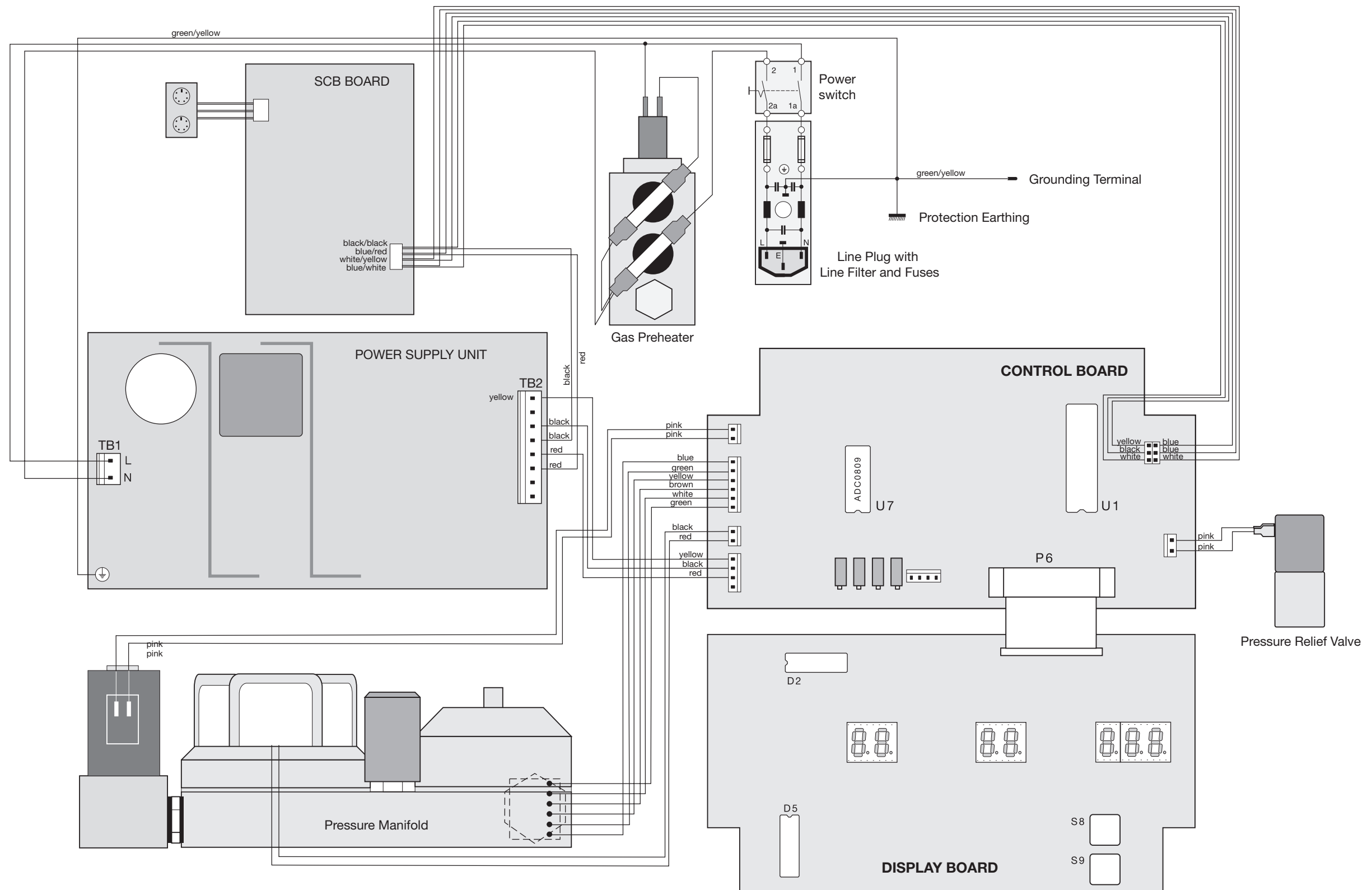
The most recently set setpoints for pressure and gas flow remain stored even after the device has been switched off, but must be confirmed by pressing the buttons when the user switches the device on again.

The ELECTRONIC ENDOFLATOR® releases any overpressure in the patient by activating a blow off valve. This occurs automatically if overpressure has been present for a certain length of time.

3.1 Block diagram of the ELECTRONIC ENDOFLATOR®



3.2 Wiring diagram of the ELECTRONIC ENDOFLATOR®



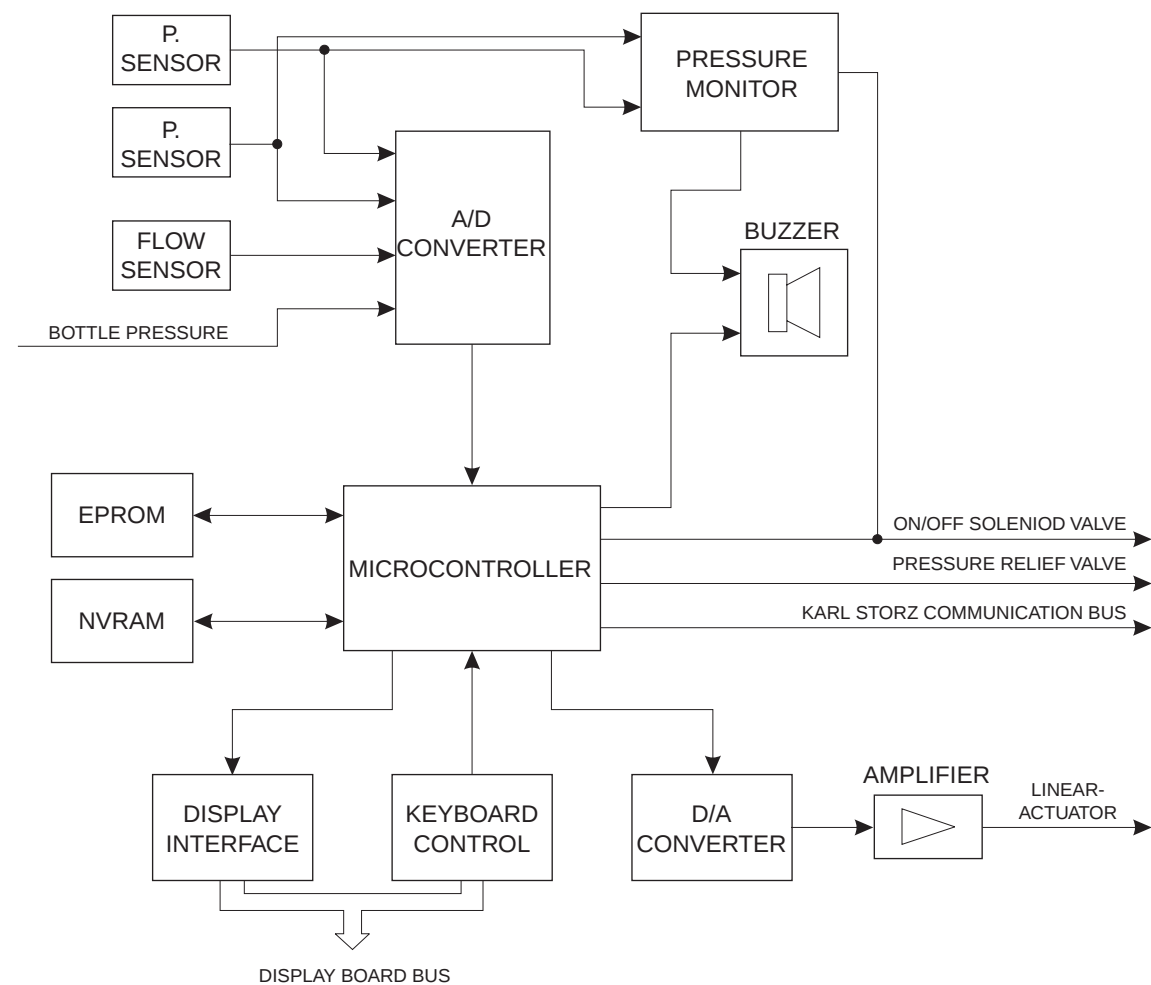
3.3 ELECTRONIC ENDOFLATOR® electronics

3.3.1. Control board

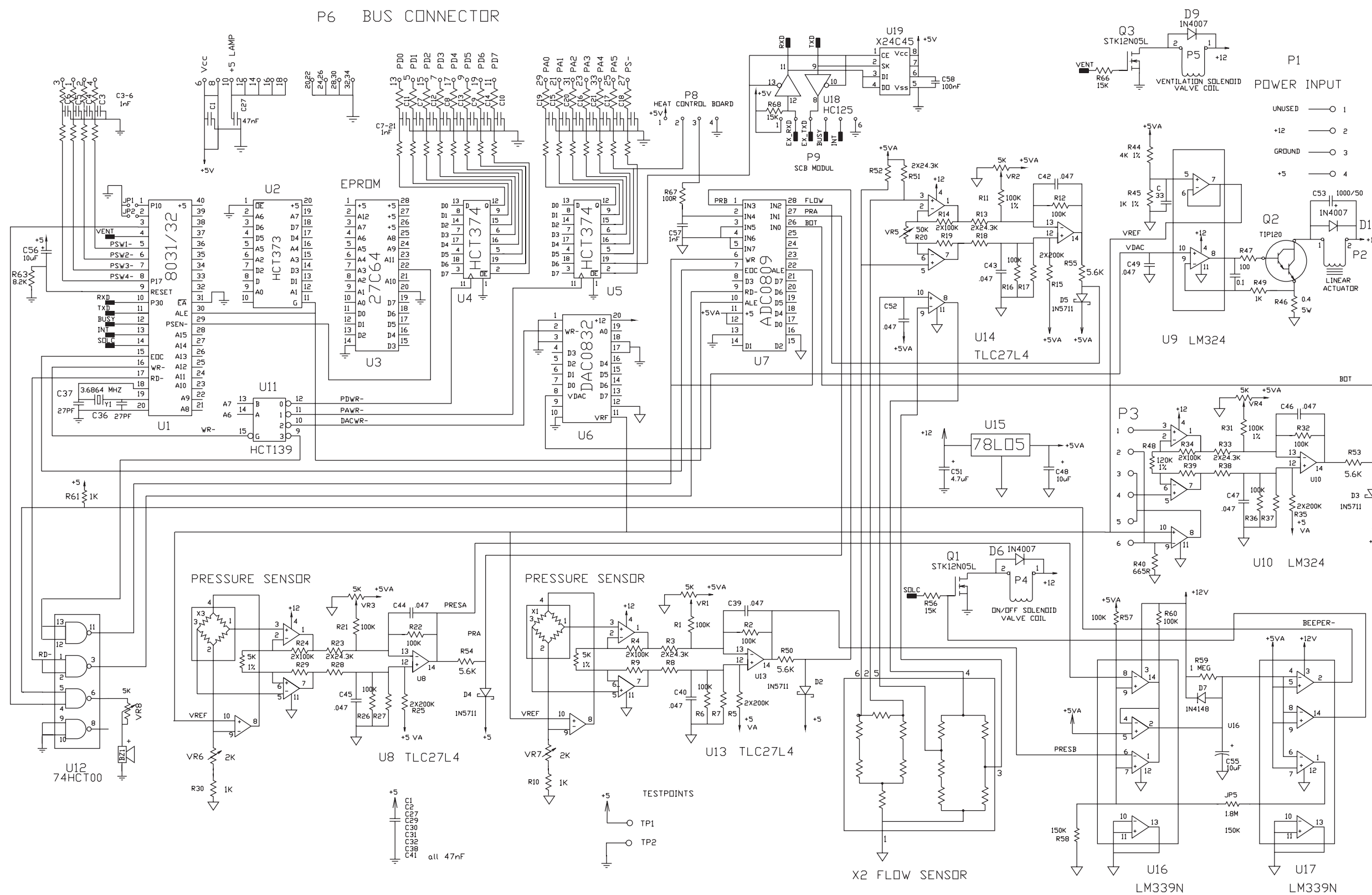
3.4.1.1 Description of control board operation

The control board houses all analog and digital systems to record, process and control measured values. The most important components are shown in Section 3.4.1.2 Block diagram of the control board. The remaining details can be found in Section 3.4.1.3 Circuit diagram of the control board.

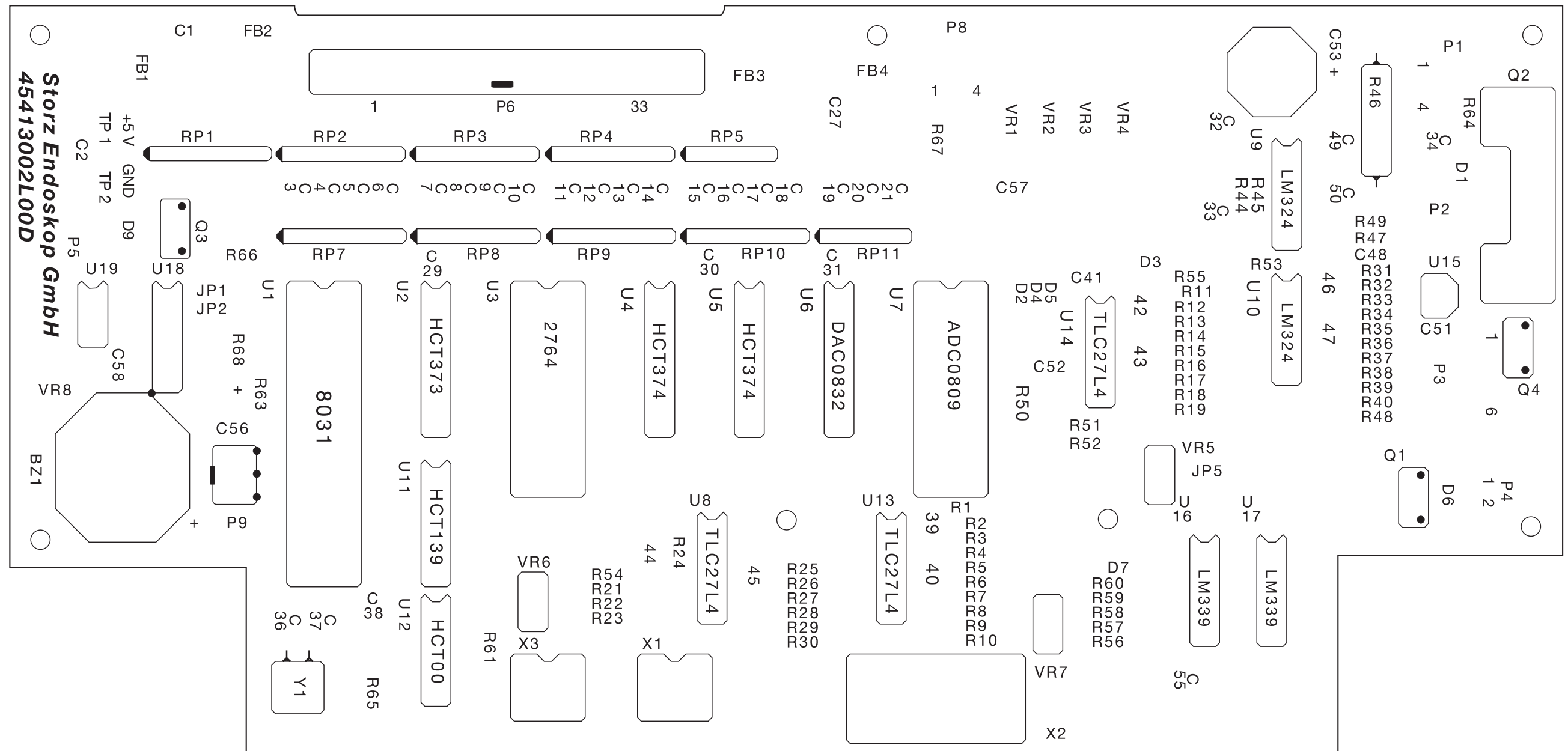
3.4.1.2 Block diagram of the control board



3.4.1.3 Circuit diagram of the control board



3.4.1.4 Component diagram of the control board

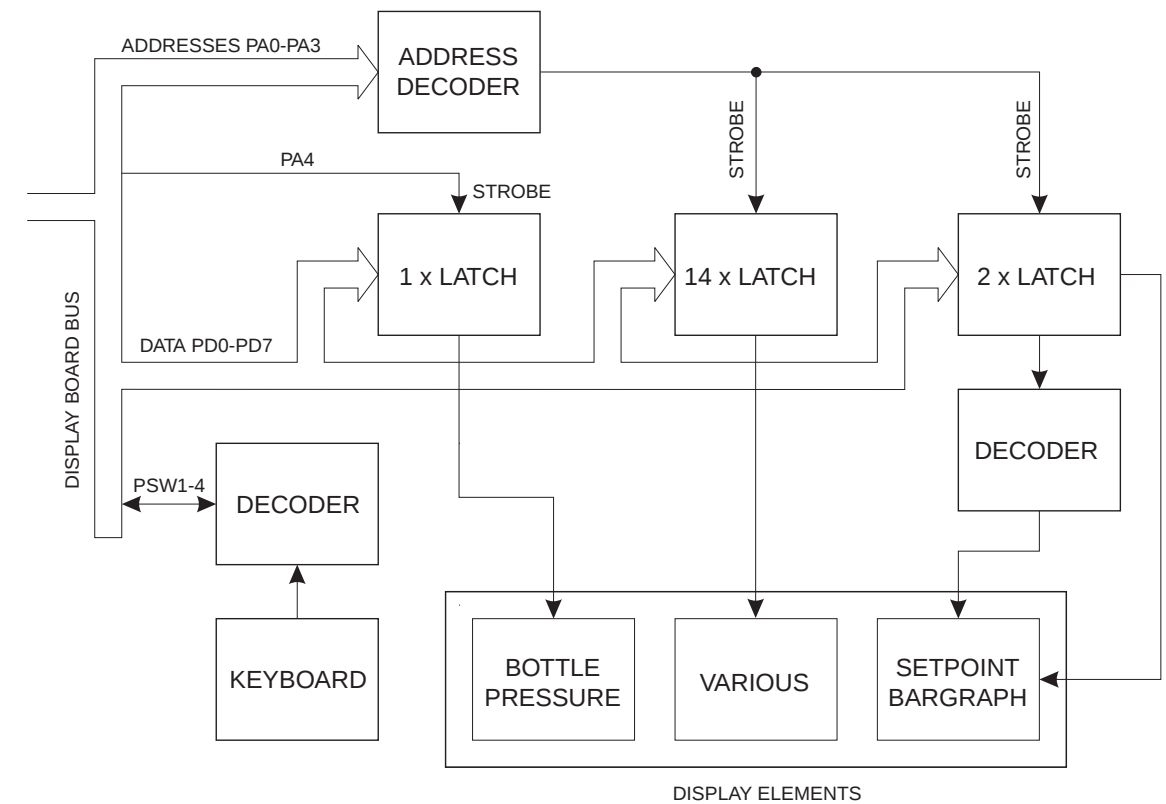


3.3.2. Display board

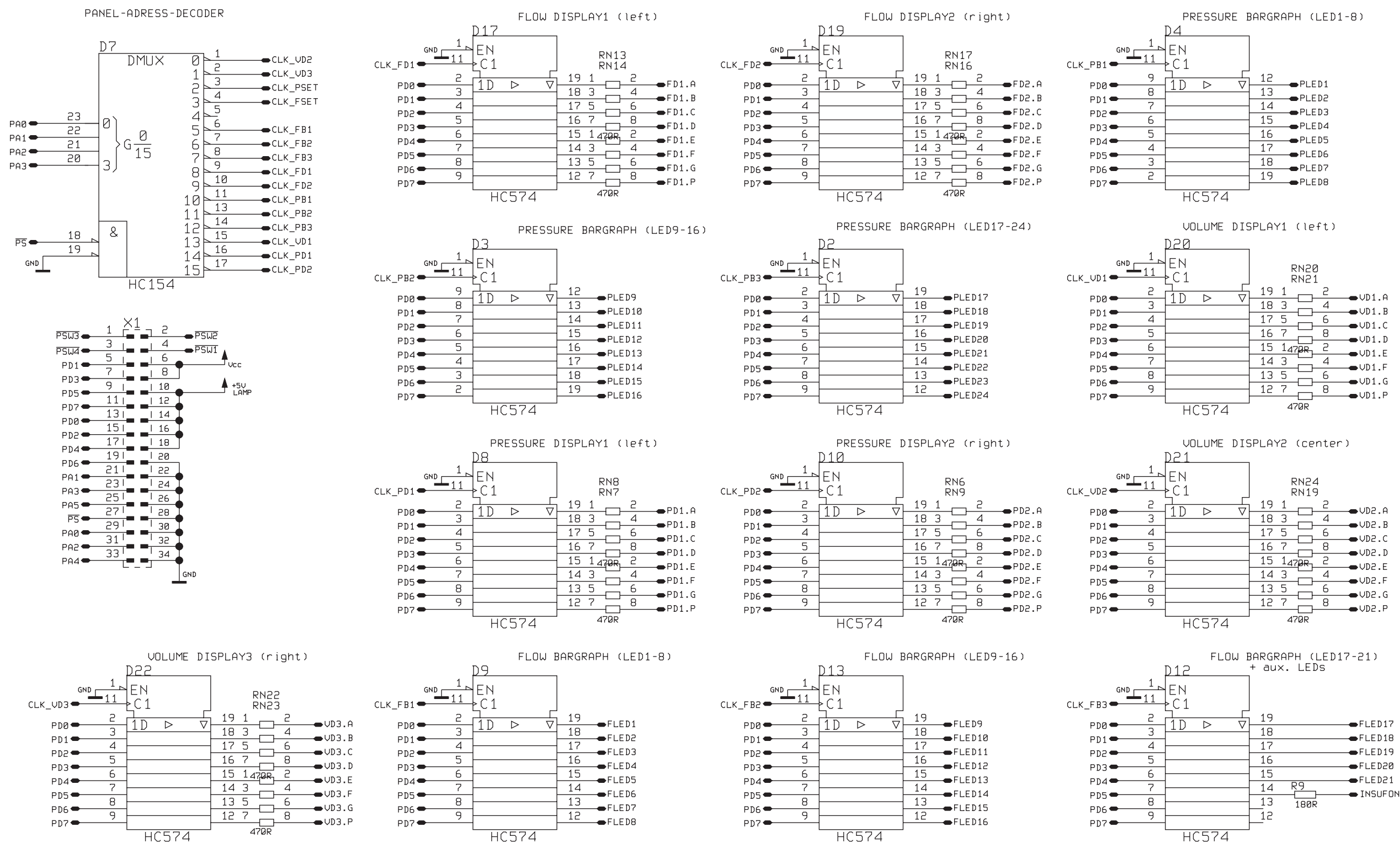
3.4.2.1 Description of display board operation

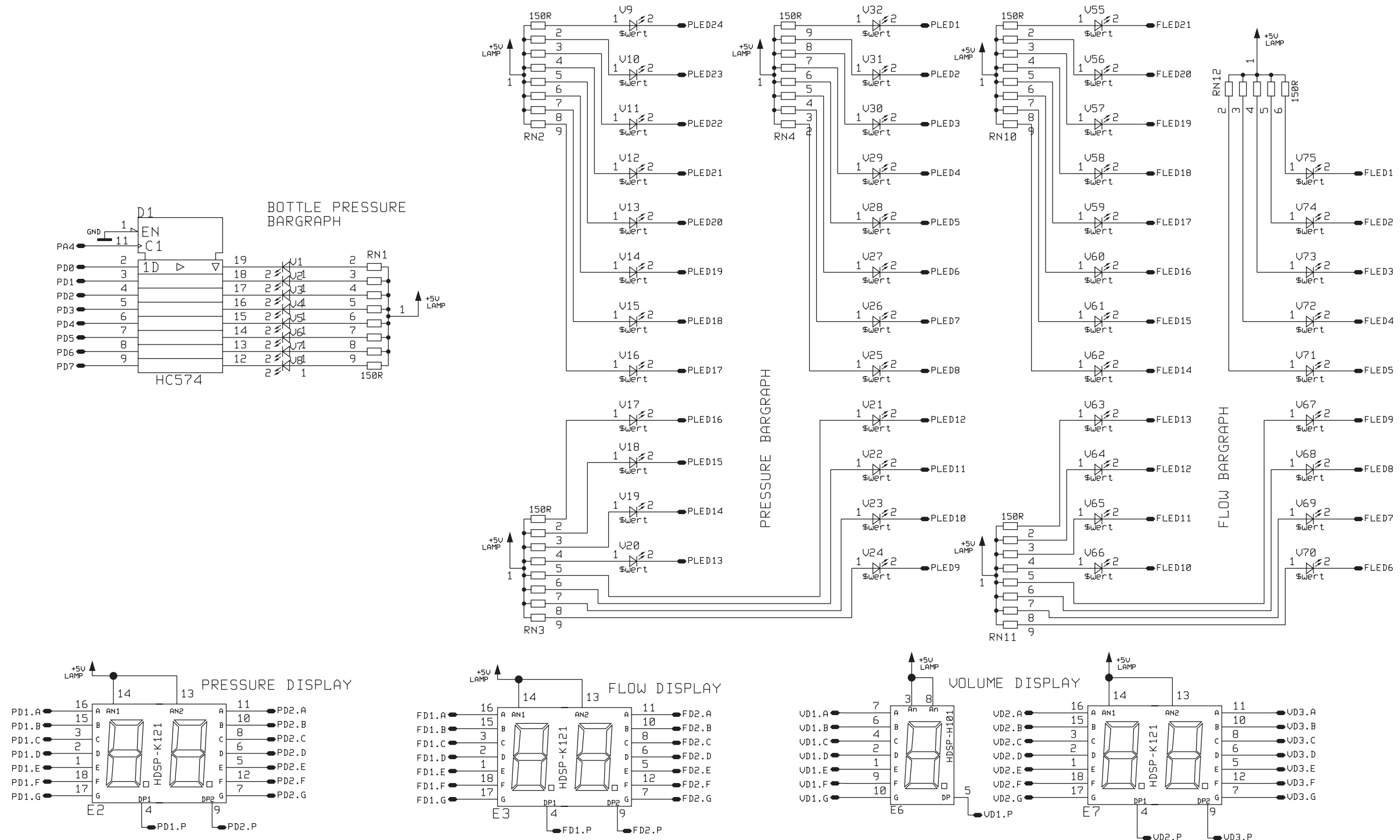
The display board is connected to the control board via the 34-pin front panel bus. It contains all input, display and control components necessary to create the desired operating interface. Section 3.4.2.2 Block diagram of the display board gives an overview of the function units on the display board.

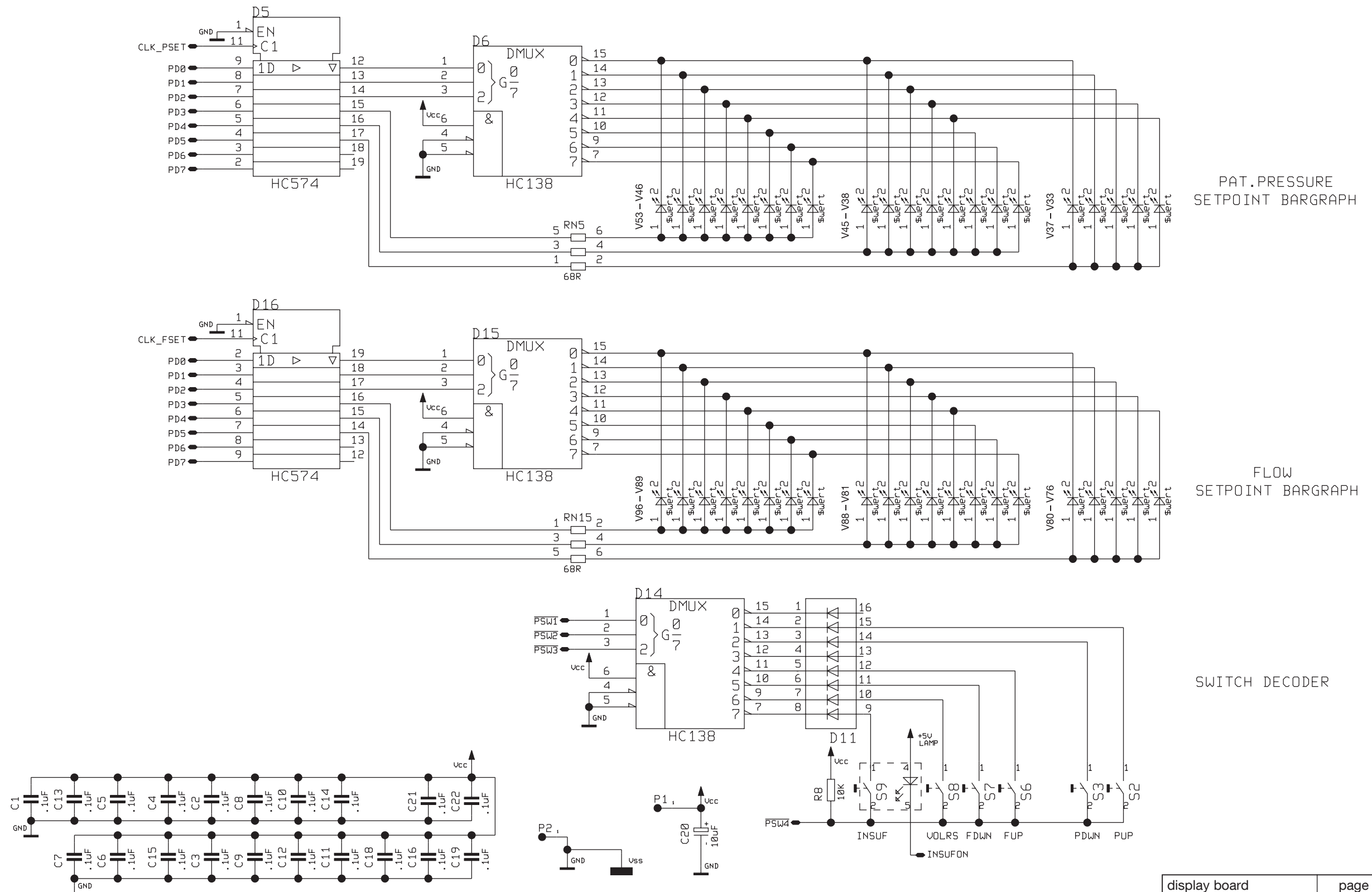
3.4.2.2 Block diagram of the display board



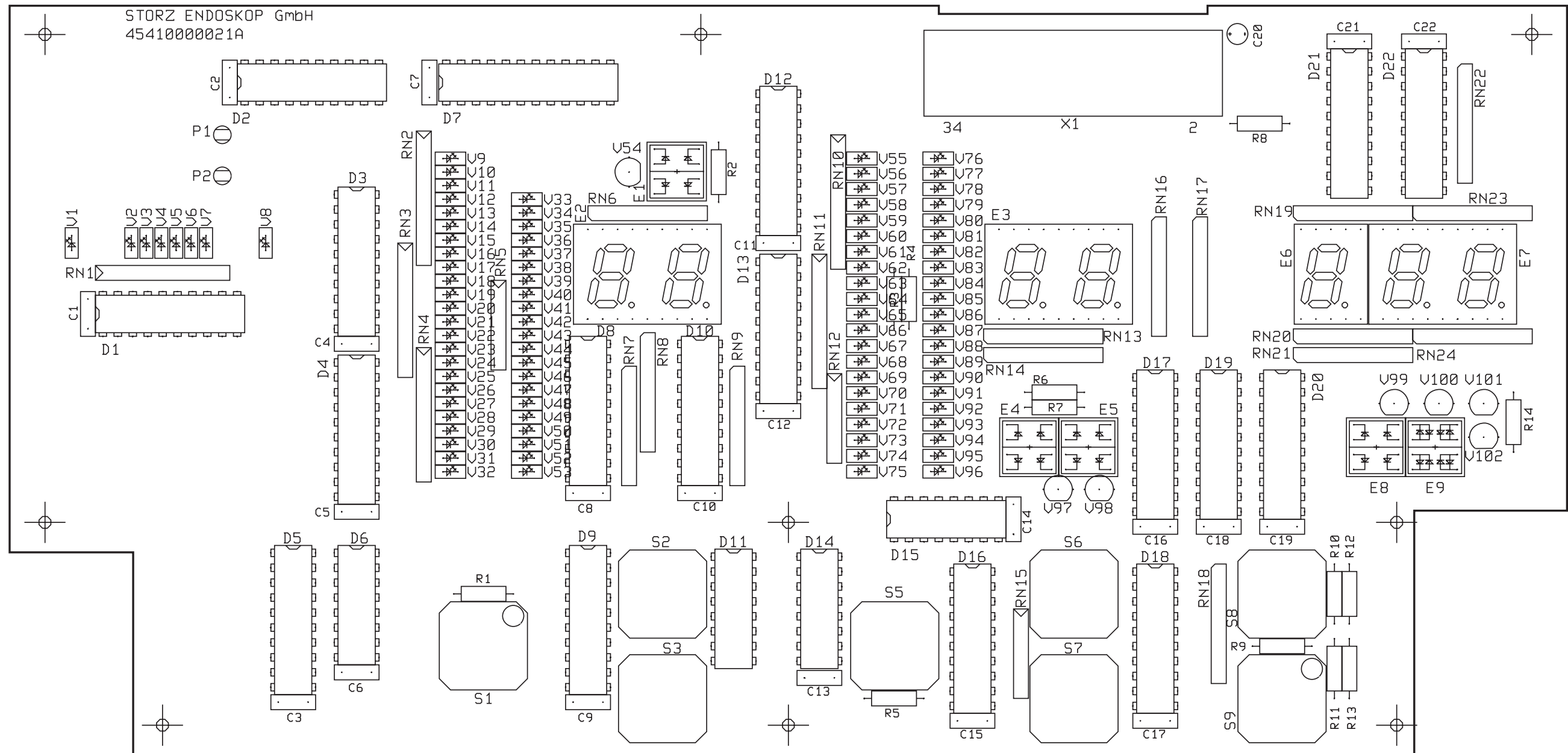
3.4.2.3 Circuit diagram of the display board







3.4.2.4 Component diagram of the display board



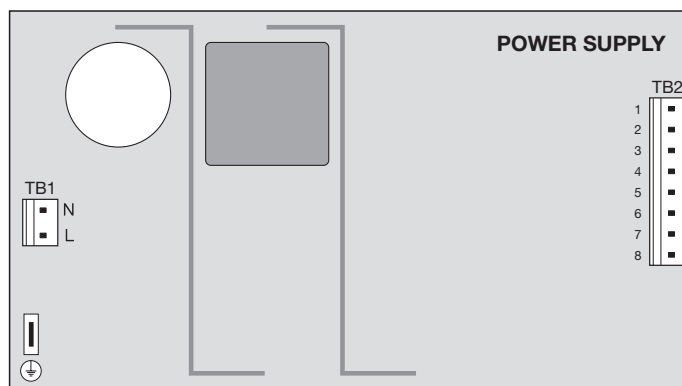
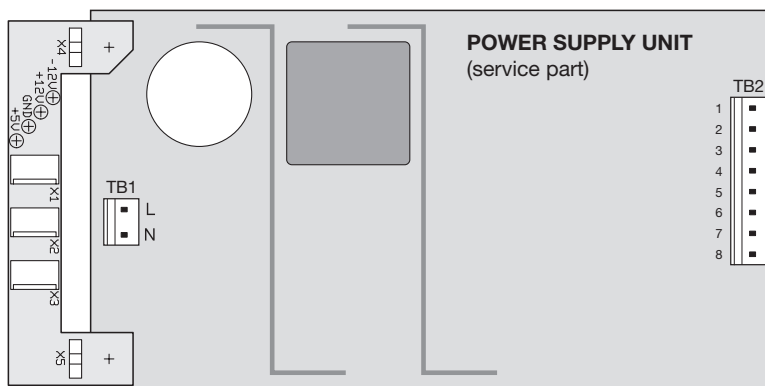
3.4.3. Power supply unit

3.4.3.1. Description of power supply unit operation

A 60 W power supply unit (order no. **200102 82**) with an adapter board on top is used for the power supply to the electronics. This power supply unit of the type MZP-9561-M is approved for use in medical devices in accordance with:

- UL 2601-1
- CSA 22.2 No. 601
- EN 60601-1

PIN ASSIGNMENT	
TB 1	
PIN 1	AC live
PIN 2	AC neutral
TB 2	
PIN 1	+5.1 V
PIN 2	+5.1 V
PIN 3	GND
PIN 4	GND
PIN 5	+12 V
PIN 6	+12 V
PIN 7	-12 V
PIN 8	NC



3.4.4. Gas preheater

3.4.4.1. Description of gas preheater operation

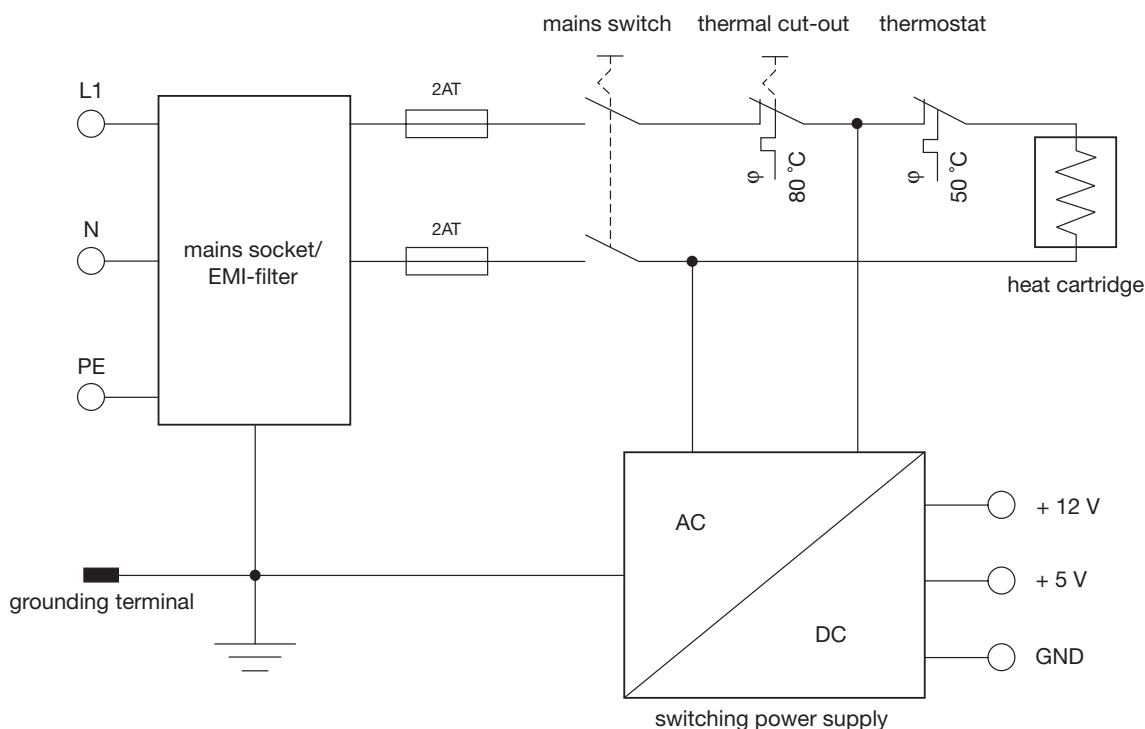
In order to protect the flow opening of the pressure manifold from icing up at times when the flow rates are high over long periods, the gas must be preheated before entering the control device. This gas heater consists of a 150 W heating cartridge and a flowmeter and is fed direct from the supply voltage.

The gas temperature is regulated by the bimetal switch on the basis of the temperature of the flowmeter block.

For safety reasons the regulatory function is monitored by a temperature limiter. If the regulatory function fails, the temperature limiter is triggered, which then switches off the heater. Simultaneously, the supply voltage from the power supply unit is cut, bringing the user's attention to the error status.

The temperature limiter does not reset itself. Authorized technical staff can return it to its normal state at the component resetting pin. To do so, the housing must be opened, see Section 4 Replacing the Individual Assemblies.

3.4.4.2. Block diagram of the gas preheater



3.4.5. KARL STORZ-SCB® module

3.4.5.1. Description of KARL STORZ-SCB® module operation

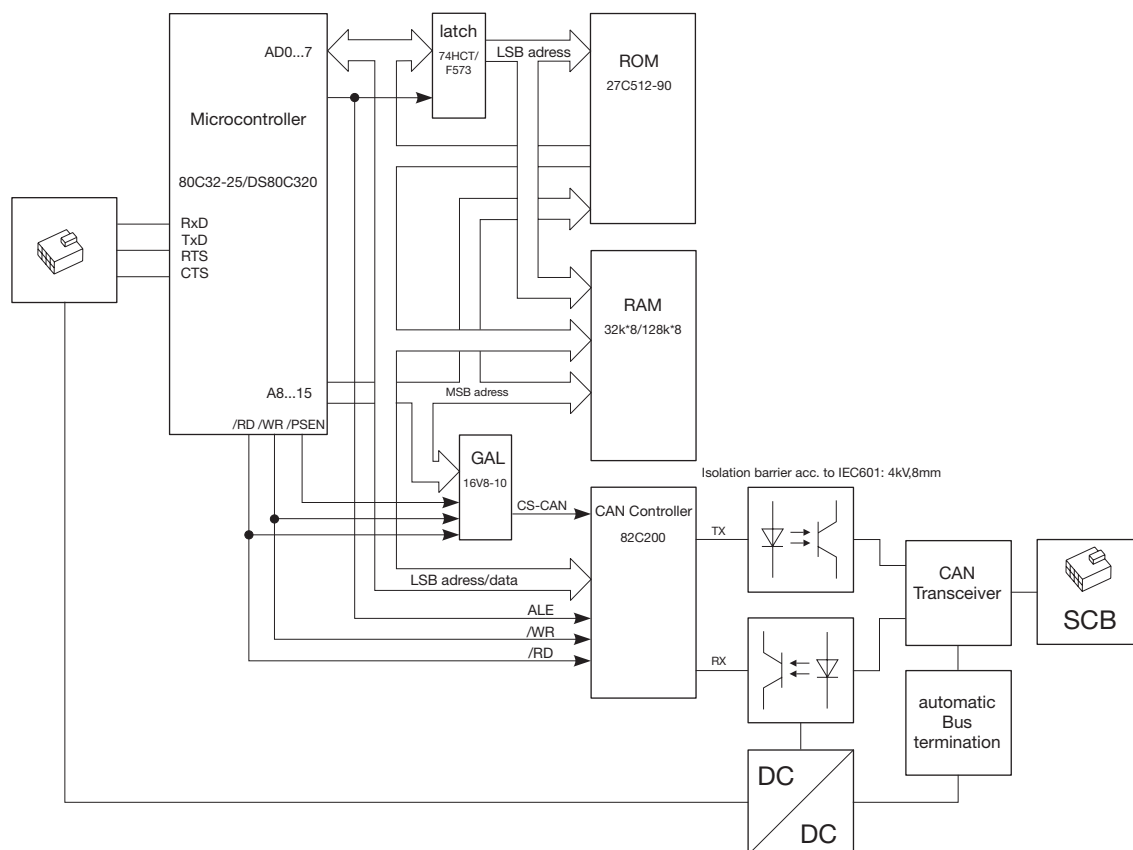
The KARL STORZ-SCB® module is a universal interface which permits communication between KARL STORZ endoscopic devices for remote indication and control purposes.

The KARL STORZ-SCB® module is designed as an option for existing KARL STORZ instruments and those manufactured in the future. As its intended use is in the medical field, it is designed in accordance with the requirements of the IEC 60601 standard. The module allows an instrument to be integrated into the KARL STORZ Communication Bus (KARL STORZ-SCB®) after customization of the module software.

The module contains the following resources:

- 64 KB program memory
- 32 KB / 128 KB data memory
- microcontroller 80C32 or 80C320
- 22,1184 MHz oscillator frequency
- control trigger / resetting on power up
- independent CAN controller
- optically decoupled CAN transceiver
- automatic bus termination
- RS232 interface with hardware handshake
- 12 bit DIL switch for entering the serial number

3.4.5.2. Block diagram of the KARL STORZ-SCB® module



3.5 Troubleshooting

Symptom	Possible cause	Remedies
Complete failure of the device.	No power from the power supply.	Check power supply.
	Power cord faulty.	Replace power cord.
	Power fuses faulty.	Replace fuses as described in instruction manual, make sure to use correct type of fuse.
	Power cord is not properly connected to power cord receptacle.	Push power cord firmly into power cord receptacle.
	Temperature limiter has been triggered.	Replace temperature limiter. Carry out test for proper functioning.
No gas flow.	Bottle empty or not fully open.	Open gas bottle fully (check gas supply on gas reserve indicator).
	Insufflation not switched on.	Switch on insufflation.
	Solenoid valve faulty.	Replace solenoid valve.
	Pressure manifold faulty or dirty.	Replace or clean pressure manifold.
Pressure does not build up.	Leak in tube system.	Check tube system, especially the connections and, if necessary, replace.
	Control circuitry faulty.	Check and, if necessary, repair low pressure stage.
		Check and, if necessary, replace control components on the control board.
Device signs sporadically off or on to SCB.	Utility line faulty.	Replace utility line, see chapter 7.5.



CAUTION: Always unplug the device from the power supply before carrying out any repairs on it!

3.6 Technical data

ELECTRONIC ENDOFLATOR® 26 4305 20 / 26 4305 20-1	
Supply voltage	100 VAC ... 240 VAC
Power frequency	50 Hz ... 60 Hz
Power consumption	250 VA
Power fuses	2 x T 2.0 AL / 250 V
Gas inlet:	
– pressure	max. 160 bar
– gas type	CO ₂ liquified, USP
Gas output:	
– gas flow	0 l/min ... 20 l/min (+20% / -10%) adjustable in 0.1 l/min steps (up to 10 l/min) or 1 l/min steps (10 l/min ... 20 l/min)
– insufflation pressure (max.)	0 mmHg ... 30 mmHg (±1 mmHg) adjustable in 1 mmHg steps
Operating temperature	10 °C ... 40 °C (50 °F ... 104 °F)
Dimensions (w x h x d)	305 mm x 155 mm x 233 mm
Weight	6.0 kg
Storage and transport conditions:	
Storage temperature	0 °C ... 60 °C (32 °F ... 140 °F)
Humidity	0% ... 95% rel. humidity, non-condensing
Atmospheric pressure	+500 hPa ... +1080 hPa

Standard compliance

According to IEC 60601-1, UL 2601.1, CAN / CSA C22.2 No. 601.1-M90:

Type of protection against electric shocks:

Protection Class I

Degree of protection against electric shocks:

Applied part of type BF¹⁾  / CF²⁾ 



Please read the Electromagnetic Compatibility Information in the appendix of the instruction manual.

According to IEC 60601-1-2:2001:

Directive compliance

According to Medical Device Directive (MDD):

Medical device in Class II b

This medical device bears the CE mark according to MDD 93/42/EEC. A code number after the CE mark indicates the responsible notified body.



¹⁾ Valid for devices up to serial no. 20424 (applied part type BF)

²⁾ Valid for devices as from serial no. 20425-B (applied part type CF)

Replacement of Individual Assemblies

Appendix 8

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4.1 Information about replacements

The device is fully adjusted and tested before it leaves the manufacturers. If the device fails, a test of the assemblies should be carried out by authorized KARL STORZ technical staff.



CAUTION: Before replacing the control board or the KARL STORZ-SCB® module, which can be used as an option, first check the compatibility of the following modules:

- device software
- KARL STORZ-SCB® module software
- KARL STORZ-SCB® RUI

If in doubt, contact the OR1™ Service.

4.2 Tools required for replacing the individual assemblies

– Housing types

Slot head screwdriver, size 4

Torx key 10

order no. 5610612

Torx key 20

order no. 5625112

– Control board, display board, front panel

Hexagonal socket wrench, size 5.5

Side cutters

Torx key 10

order no. 5610612

Conductive work mat, wrist band, ground cable

– Pressure manifold, power supply unit, gas preheater

Torx key 20

order no. 5625112

Torx key 25

order no. 5625212

Wrench 12 mm

Wrench 17 mm

Conductive work mat, wrist band, ground cable

– Line plug with line filter

Torx key 10

order no. 5610612



CAUTION: Always unplug the device from the power supply before carrying out any repairs on it! To prevent damage to the components caused by the build-up of electrostatic charges, we recommend that you connect yourself to ground via the wristband throughout servicing.

After servicing, a safety test, the leakage current and protective ground resistance measurements according to IEC 62353, IEC / UL 60601-1, CAN / CSA C22.2 NO 601.1, whichever may apply, are to be carried out.



4.3 Opening the various types of housing

Opening the standard housing

Insert a screwdriver into the recess at the rear of the side cover and lift the cover out toward the front.

(Slot head screwdriver, size 4)



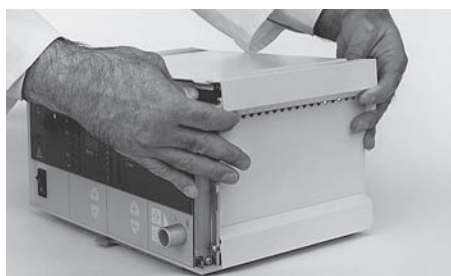
Undo the upper screw located under the side panel on the front of the device.

(Torx key 20)



Similarly, undo the corresponding upper screw on the rear of the device.

(Torx key 20)



To release the housing cover, grip both ends and pull upward.



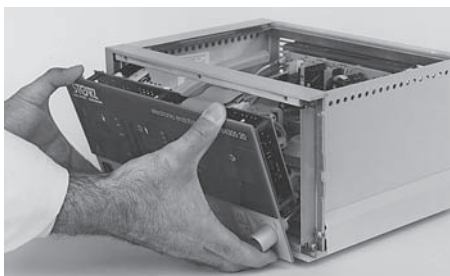
The housing cover can now be removed toward the right.



Remove the tube connection gas flow splitter / solenoid valve from the solenoid valve.



Pull out the two sliding bolts of the front panel sideways using a screwdriver or the like.



Remove the front panel and all boards toward the front.



Opening the new system housing

NOTE: The new system housing is used in devices with serial no. 7550-B and higher.

Undo the screws on the underneath of the device.

(Torx key 10)



Optionally undo the screws on the rear of the device and remove the bottle stand.

(Torx key 20)

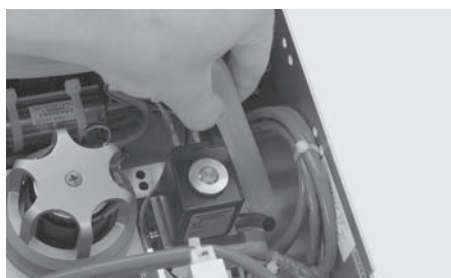


Insert a screwdriver into the recess at the rear of the side cover and lift the cover out toward the front.

(Slot head screwdriver, size 4)



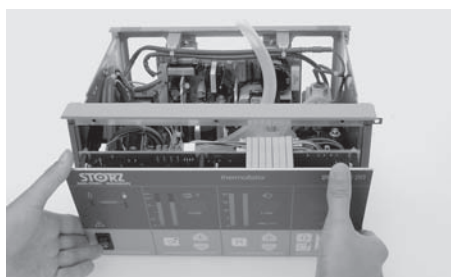
Pull the housing cover off toward the rear.



Remove the tube connection gas flow splitter / solenoid valve from the solenoid valve.



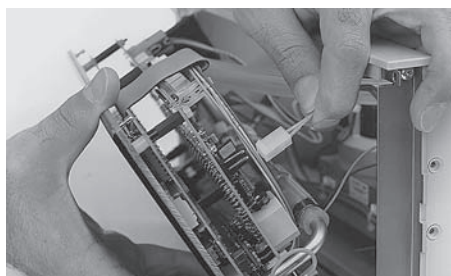
Pull out the two sliding bolts of the front panel sideways using a screwdriver or the like.



Remove the front panel and all boards toward the front.

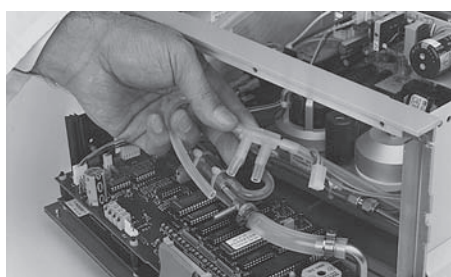
4.4 Replacing the control board, display board and front panel

Open the housing as described in Section 4.3 Opening the various types of housing.

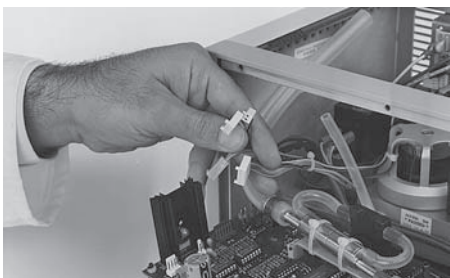


Replacing the control board

Remove the connecting cable of the blow off valve from the control board.

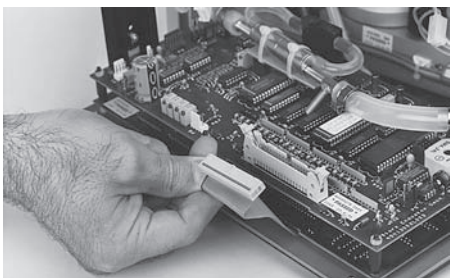


Remove the patient pressure transducer connectors and blow off valve tube connections from the control board and the gas flow splitter.

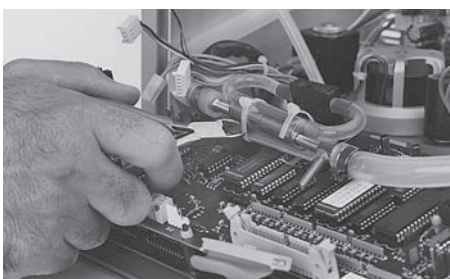


Remove all cable connections on the left side of the control board.

ⓘ NOTE: *The cable connections can become mixed up, attention should therefore be paid to their positioning so that it is possible to reproduce the connections correctly during assembly.*



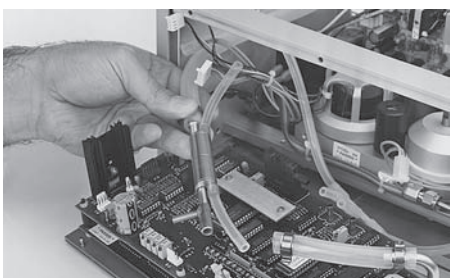
Also remove the control board / display board (ribbon cable) cable connection.



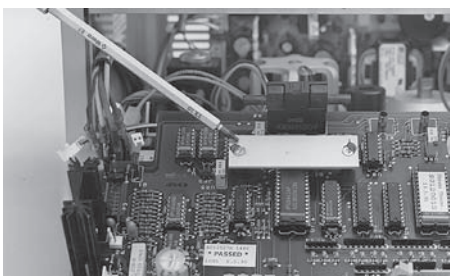
Undo the cable ties which serve to hold the gas flow splitter in place.

(Side cutters)

ⓘ NOTE: *For assembly, use cable ties with metal locking mechanism.*

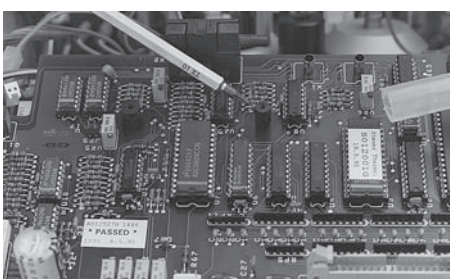


Remove the gas flow splitter tube connections from the flow sensor on the control board and the insufflation connection to the patient.

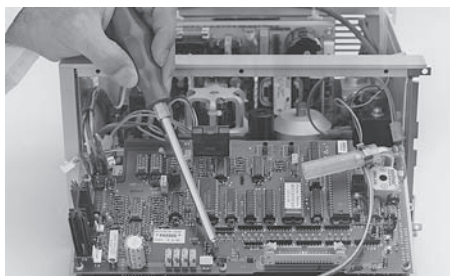


Undo the two screws on the fixing plate for the gas flow splitter.

(Torx key 10)

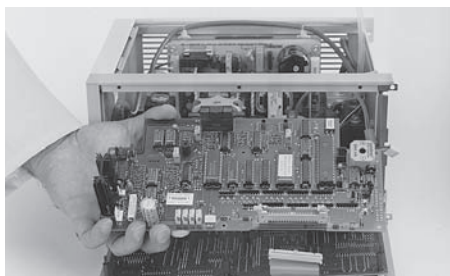


Similarly, undo the right spacing bolt.

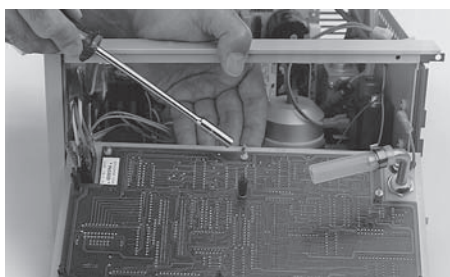


To replace the control board, undo the five transparent nuts.

(Hexagonal socket wrench, size 5.5)



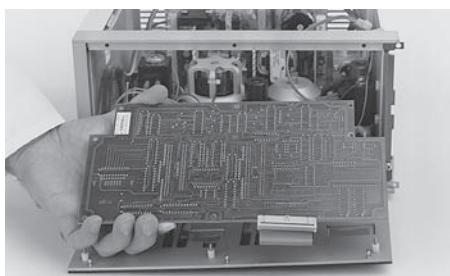
The control board can now be replaced.



Replacing the display board

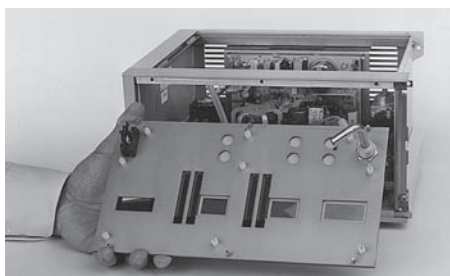
To replace the display board, first of all undo the six spacing bolts (fastening screws) and the three transparent nuts.

(Hexagonal socket wrench, size 5.5)



The display board can now be removed from above.

i NOTE: When securing the new display board every nut must be tightened to a similar torque and not too tightly, so as not to impair the functionality of the buttons.



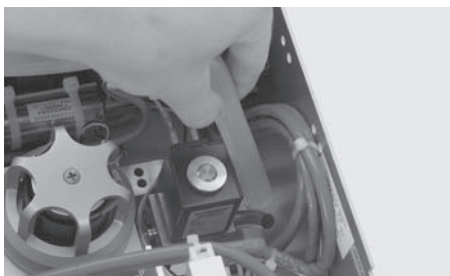
When the display board has been removed and the cable connections have been pulled off the power switch, the front panel is freely accessible.

To assemble, proceed in the reverse order.

i NOTE: In order to avoid connecting up the assemblies incorrectly when assembling, refer to Section 3.3 Wiring diagram of the ELECTRONIC ENDOFLATOR®.

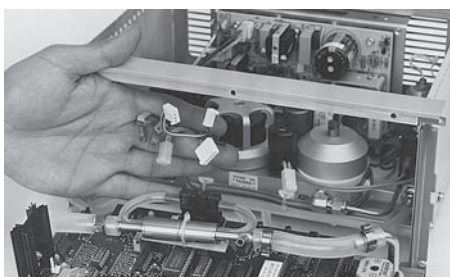
4.5 Replacing the pressure manifold, power supply unit and gas preheater

Open the housing as described in Section 4.3 Opening the various types of housing.



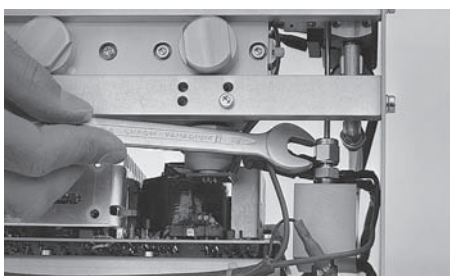
Replacing the pressure manifold

Remove the tube connector from the solenoid valve.



Then remove all cable connections from the control board and the front panel.

NOTE: The cable connections are designed so they cannot be mixed up in order to prevent them from being connected up incorrectly when assembling.



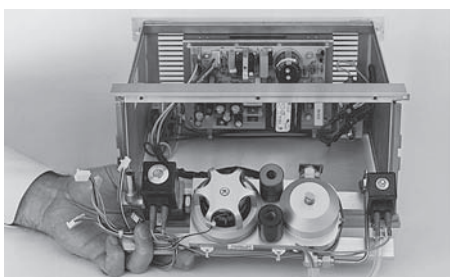
Undo the union nut on the pressurized line to the gas preheater.

(Wrench 12 mm)

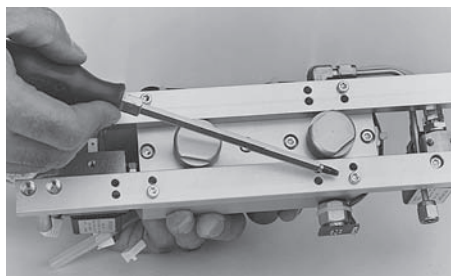


Also undo the four module rail fastening screws on the side panels.

(Torx key 25)

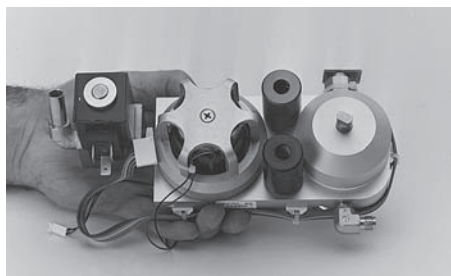


The complete module (pressure manifold / blow off valve) can now be taken out of the housing.

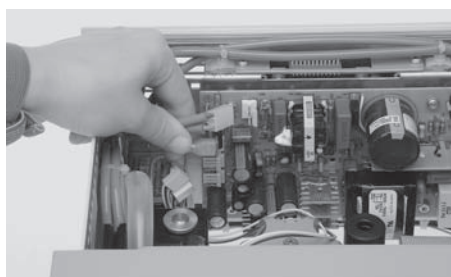


To replace the pressure manifold, undo the four fastening screws for the module rails.

(Torx key 20)



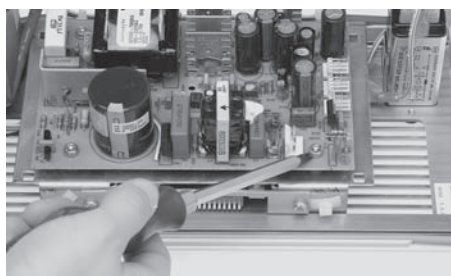
The pressure manifold can now be replaced.



Replacing the power supply unit

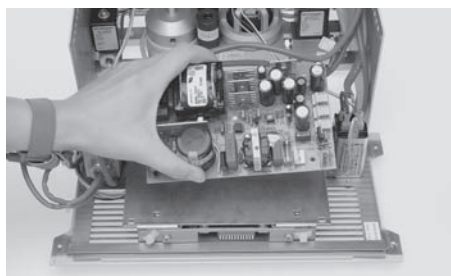
Remove all cable connections from the power supply unit.

NOTE: As from serial no. XX9110 the new power supply unit order no. 200102 82 is installed, see Section 3.4.3 Power supply unit. To get more information on installing the new power supply, see Section 7.3 Upgrade kit for power supply unit model 200102 82.



To replace the power supply unit, undo the four fastening screws on the board.

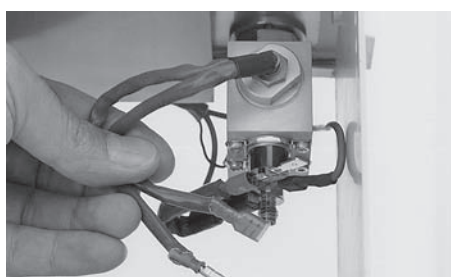
(Torx key 20)



The power supply unit can now be replaced.

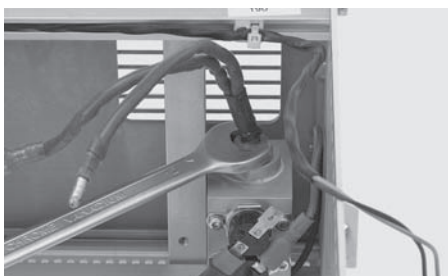
(Torx key 20)

CAUTION: The three plastic insulating spacing bolts and the one metal spacing bolt on the upper left between the power supply unit and the power supply mount must not be forgotten or mixed up. For units with the new power supply unit, the metal spacer bolt can be found at the PE connection.



Replacing the heating cartridge (gas preheater)

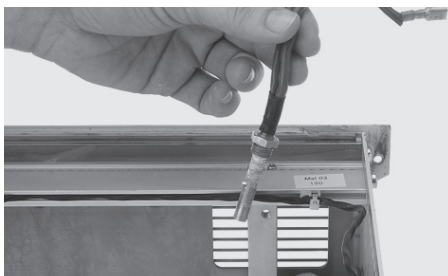
Remove the two cable connections to the heating cartridge.



Undo the heating cartridge with a wrench 12 mm while locking the swirl body with a wrench 17 mm.

(Wrench 12 mm, wrench 17 mm)

NOTE: In the case of devices produced since January 2002 and also gas preheaters repaired since January 2002, the swirl body is glued in with sealing fluid (order no. 5903550). For this reason the associated o-ring is no longer necessary.



The heating cartridge can now be replaced.

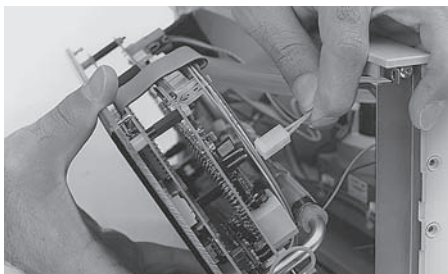
Apply heat-conductive paste (order no. 79100000002) to the new heat cartridge before mounting it.

To assemble, proceed in the reverse order.

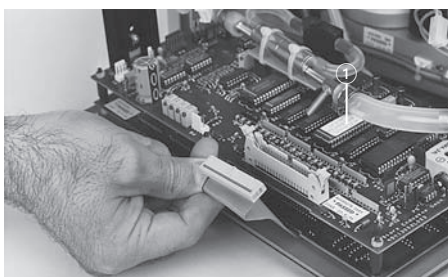
NOTE: In order to avoid connecting up the assemblies incorrectly when assembling, refer to Section 3.3 Wiring diagram of the ELECTRONIC ENDOFLATOR®. It must be checked that the protective grounding on the rear panel is properly secured in accordance with IEC 60601-1 by carrying out a visual inspection and electrical test.

4.6 Replacing the EPROM and the microcontroller

Open the housing as described in Section 4.3 Opening the various types of housing.



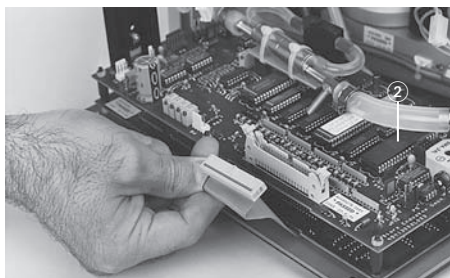
Remove the connecting cable of the blow off valve from the control board.



Replacing the EPROM

Replace the EPROM.

CAUTION: When using the new EPROM, make certain you have the correct mounting position (recess). At the same time, avoid bending or kinking the pins.



Replacing microcontroller

Replace the microcontroller.



CAUTION: When using the new microcontroller, make certain you have the correct mounting position (recess). At the same time, avoid bending or kinking the pins.

To reassemble proceed in reverse order.



NOTE: After replacing with the new EPROM and the microcontroller, check the equipment functions and, if necessary, perform a readjustment, see Section 5 Testing and Adjustments.

Section 5.

Testing and Adjustments

Direction Sign:

- | | | | |
|---|---|--|-----|
| 1 | ↩ | Instruction Manual | |
| 2 | ↩ | Physical Design | |
| 3 | ↩ | Descriptions of Operation and Circuit Diagrams | |
| 4 | ↩ | Replacement of Individual Assemblies | |
| | | Maintenance and Safety Checks | ⇒ 6 |
| | | Modifications and Supplements | ⇒ 7 |
| | | Appendix | ⇒ 8 |

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5.1 Information on testing and adjustments

The device is fully adjusted and tested before it leaves the manufacturers. Re-adjustment should only be carried out by qualified technical staff.

In order to determine the origin of certain faults in closed devices, the ELECTRONIC ENDOFLATOR® has the following test routines:

– Service programs P1, P2 and P3

If the device is switched on while the volume reset button is pressed, P1 appears briefly on the display. Depending on the default operating mode, the high supply pressure mode (HiSup) or the low supply pressure mode (LoSup) can be set using the '+ / -' buttons in the 'flow display field'. These settings permit various different warnings and displays.

If CO₂ bottles (high supply pressure) are used, the bottle pressure is shown in the 'gas bottle pressure gauge' field. If the bottle is empty (pressure less than 7 bar), a 'bottle empty' alert is sounded, which also appears on the monitor in the KARL STORZ-SCB® system.

If the ELECTRONIC ENDOFLATOR® is connected to a central gas supply (low pressure supply), only the right green LED lights up to indicate the status.



CAUTION: This display also appears when no gas is being supplied to the device. A 'bottle empty' alert is not sounded. Nothing is displayed in the KARL STORZ-SCB® system.

Pressing once more the '+ / -' buttons in the 'Pressure' field activates the service program P2. This is an LED test program.

Pressing once more the '+ / -' buttons in the 'Pressure' field activates the service program P3. This displays the number of operating hours of the device.

– Hex display mode

If the device is switched on while the 'Start / Stop' button is pressed, it is in the 'Hex display mode'.

Here, the output voltage of the four boosters (bottle pressure, patient pressure A, patient pressure B, flow) is shown directly on the displays in the form of a hex value, see Section 5.3.2 Offset adjustment.

5.2 Measuring instruments required for the individual settings

- Safety isolating transformer
- Multimeter with test leads
- Pressure gauge
- Pressure transducer (0 bar ... 0.4 bar)
- Flow measuring instrument (up to 13 l/min), calibrated for CO₂, 20 °C, 1013 mbar
- Hand pump with tubes and T-fitting
- Insufflation tester
- Adjustment tool

5.3 Adjusting the control board

Control board adjustments can only be carried out on the fully assembled device. To do so, switch on the device at least 10 minutes beforehand.

5.3.1. Setting the operating voltage

The 5.1 VDC operating voltage can be measured between test points TP1 and TP2 on the control board. If necessary, the voltage can be re-adjusted with R21 on the power supply unit³⁾. After re-adjusting the 5.1 VDC operating voltage, offset adjustment, and, if necessary, gain adjustment should be carried out.

³⁾ Valid only for power supply unit order no. 20 0102 90.

5.3.2. Offset adjustment

Separate offset adjustment must be carried out for each of the function areas patient pressure A, patient pressure B, bottle pressure and flow. With a shorting plug on JP1 the ELECTRONIC ENDOFLATOR® is switched to the 'Hex display mode'. This mode can also be initiated by pressing the 'Start' button while switching on the device (exited only by switching off).

Using the trimmer VR1, the offset for patient pressure B is adjusted to the value '21' in the volume display.

Using the trimmer VR2, the offset for flow rate is adjusted to the value '10' in the flow display.

Using the trimmer, VR3 the offset for patient pressure A is adjusted to the value '21' in the patient pressure display.

Using the trimmer VR4, the bottle pressure is adjusted so that two green LEDs light up in the gas bottle pressure gauge. Here, no supply bottle may be connected up; nor may insufflation have started.

5.3.3. Gain adjustment patient pressure

Separate adjustment using VR6 and VR7 must be carried out for each of the two identically structured pressure boosters. To do so, pressure must first be indicated on pressure transducer B (item X1). The value in the numerical pressure gauge must now correspond to a reference device which is operated in parallel. The display can be set using VR7. The pressure gauge must be compared for several values (5 mmHg, 15 mmHg, 30 mmHg). VR7 and VR1 are interdependent. The offset and gain adjustment may possibly have to be repeated a number of times alternately.

Then pressure is applied to both pressure transducers simultaneously and, with a shorting plug on JP1, the displayed hex value compared on both boosters. Using VR6 booster A is adjusted so that the displays correspond. Here, too, the two displays must be compared for the three values given above. VR6 and VR3 are interdependent.

The offset and gain adjustment may possibly have to be repeated a number of times alternately. The device display and the reference display should not differ by more than 0.5 mmHg.

5.3.4. Gain adjustment flow

For the function area flow, gain adjustment must be carried out using VR5. To do so, a calibrated flowmeter is connected to the patient output. Ensure that the flow resistance of the supply lines and measuring instruments is as low as possible, otherwise the maximum flow possible might not be attained. Using a shorting plug on JP2 the ELECTRONIC ENDOFLATOR® is switched to the 'Sustain mode', in order to generate a uniform flow of gas.

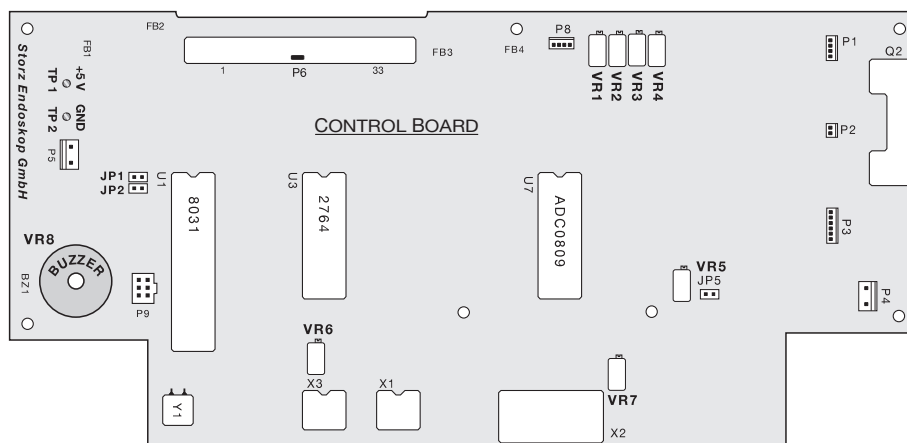
The setpoints are set to 20 mmHg and 16 l/min. After insufflation has started, the flow display of the device and that of the flowmeter are adjusted using VR5. VR5 and VR2 are interdependent. The offset and gain adjustment may possibly have to be repeated a number of times alternately. Using a gas volume meter at the patient output, the flow is checked in normal operation (without shorting plug).

In doing this, the values in the following table must be adhered to (pressure setpoint 20 mmHg):

Flow setpoint [l/min]	Flow display [l/min]	Volume display ELECTRONIC ENDOFLATOR® [l] after 1 min	Volume display Volumenmesser [l] after 1 min
3,0	2,5 ... 3,6	2,7 ... 3,6	2,7 ... 3,6
10,0	9,0 ... 12,0	9,0 ... 12,0	9,0 ... 12,0
20,0	18,0 ... 24,0	18,0 ... 24,0	18,0 ... 24,0

5.3.5. Setting the warning sound volume

The volume of the acoustic signal transmitter can be set using the resistance trimmer VR8. The warning sound cannot, however, be fully switched off. On dispatch, the device volume is set to max.

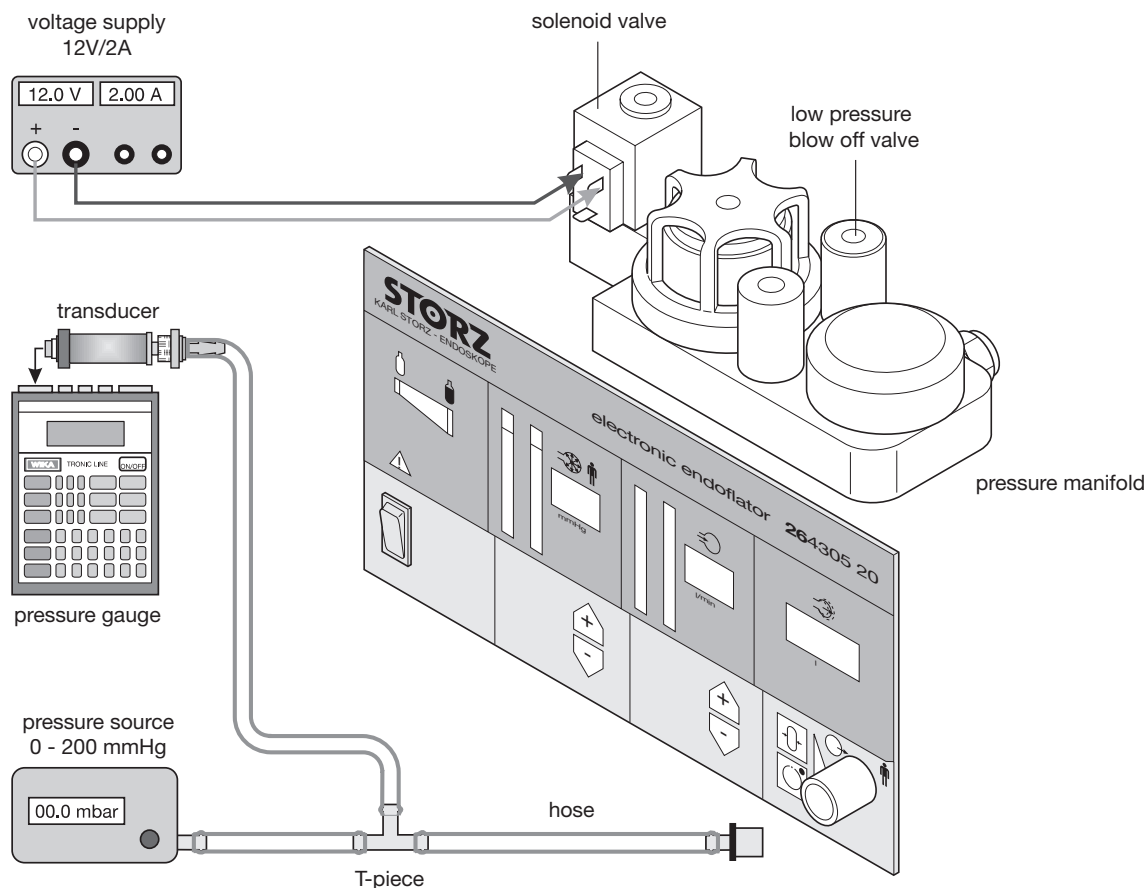


5.4 Test for proper operation of the low pressure blow off valve

- Remove the housing cover as described in Section 4 Replacement of Individual Assemblies.
- Connect up the CO₂ bottle to the device, but do not open it. The sole purpose of doing this is to ensure that a closed system exists.
- Disconnect the solenoid valve cable connections on the pressure manifold.
- Also remove the blow off valve cable connections.
- Connect the external 12 VDC power supply to the solenoid valve.
- Attach the self-made, suitable tubing set with T-piece, as shown in the diagram, to the tube connection. Connect a calibrated pressure measuring system to the free end of the T-piece. Reference measuring instruments as recommended in Section 5.2 Measuring instruments required for the individual settings.
- Connect variable pressure source (e.g. leakage tester 13242XL) to the tubing set.

! CAUTION: The pressure to be expected is between 55 mmHg and 100 mmHg.

- Slowly increase the pressure to approx. 50 mmHg. Turn off the pump and observe the pressure gauge. Check system for leaks. Repair any gas leaks.
- Increase pressure to 55 mmHg or higher, if necessary.
- The blow off pressure of the valve is displayed on the measuring instrument. It is at that point where, when the output pressure of the pressure source is further increased, the display on the measuring device, however, scarcely moves. It must be between 55 mmHg and 100 mmHg.
- Remove the external power supply from the solenoid valve.
- Reconnect the cable connections of the solenoid and blow off valve to the print.
- Remove the tube connection from the insufflation connection.
- Check the safety functions and carry out the safety checks as described in Section 6 Maintenance and Safety Checks.
- Put housing cover back on.
- If necessary, screw off tube from CO₂ bottle again.



5.5 Tests for proper operation and other tests

5.5.1. Check pressure and control response

The pressure must be checked at various different pressure setpoints between 15 mmHg and 30 mmHg. Connect the insufflation outlet to the insufflation tester and connect pressure measuring transducer 0 bar ... 0.4 bar to pressure gauge. Set small leak on the insufflation tester. The actual value displayed on the pressure gauge and the pressure digital display must be compared.

5.5.2. Check fall in pressure

Settings: Pressure 15 mmHg, flow 10 l/min

Completely close the leakage cock of the insufflation tester. Generate pressure of 15 mmHg in the insufflation tester. Remove plug P2 of the linear actuator from the control board, see Section 3.3 Wiring diagram of the ELECTRONIC ENDOFLATOR®. The fall in pressure must be equal or less than 3 mmHg per 15 s (test on pressure gauge).

5.5.3. Functional test of overpressure alert messages

Remove plug P5 of the blow off valve on the control board. Test the software alert at overpressure of > 5 mmHg above setpoint.

Settings: 15 mmHg, 10 l/min, 'gas flow' button ON

Completely close the leakage cock of the insufflation tester. The software alert must be triggered between 18.0 mmHg and 22.0 mmHg with a delay of 3 s. At the insufflation tester balloon, overpressure is generated by hand so that a pressure of 17.9 mmHg is displayed on the pressure gauge. After 3 s no alert may sound and the solenoid valve may not close. Set the pressure to 22.0 mmHg by hand using the insufflation tester balloon. After 3 s an intermittent alert must sound and the solenoid valve is switched off.

Test the hardware alert at actual pressure > 30 mmHg.

Settings: 30 mmHg, 10 l/min, 'gas flow' button OFF

Completely close the leakage cock of the insufflation tester. The hardware alert must be triggered between 30.0 mmHg and 33.0 mmHg with a delay of 5 s. An overpressure of 29.9 mmHg is generated by hand using the insufflation tester balloon. After 5 s no alert may sound. Set the pressure to 33.0 mmHg by hand using the insufflation tester balloon. After 5 s a continuous alert must sound. Reconnect plug P5 of the blow off valve on the control board.

5.5.4. Negative alert

Set small leak on the insufflation tester and allow the pressure to release.

Settings: 10 mmHg, 10 l/min, 'gas flow' button OFF

Completely close the leakage cock of the insufflation tester. With the gas flow turned off, by pressing in and bending the output tube, low pressure is generated which triggers an acoustic warning.

5.5.5. Blow off valve

Settings: 10 mmHg, 10 l/min

With the gas flow turned on, by pressing in the insufflation tester balloon, the pressure is raised at least 5 mmHg above the setpoint. After 3 s an acoustic warning is sounded and after 5 s the pressure is released with the blow off valve (blow off and gauge pressure at 1.5 s intervals).

5.5.6. Bottle pressure gauge and 'bottle empty' test

Settings: 10 mmHg, 10 l/min, CO₂ high pressure cock closed

With the gas flow switched on the supply pressure reduces slowly and the LEDs go out one by one until only the left, red LED for the level indicator flashes. When this occurs five warning sounds are emitted, indicating an empty bottle.

Section 6.

Maintenance and Safety Checks

Direction Sign:

- 1 ⇐ Instruction Manual
- 2 ⇐ Physical Design
- 3 ⇐ Descriptions of Operation and Circuit Diagrams
- 4 ⇐ Replacement of Individual Assemblies
- 5 ⇐ Testing and Adjustments
- Modifications and Supplements ⇒ 7
- Appendix ⇒ 8

Contents 6. Maintenance and Safety Checks

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6.2	Safety checks	6-4
6.3	Safety devices	6-5
6.4	Maintenance operations	6-5
6.5	Servicing and repair	6-5
6.6	Fuse replacement	6-5
6.7	Cleaning and disinfection	6-5

6.1 ELECTRONIC ENDOFLATOR® safety functions

The pressure level of relevance to safety is monitored by several systems:

- overpressure protection through mechanical systems
- overpressure protection through hardware
- overpressure protection through software

In order to prevent a faulty device from being operated, the ELECTRONIC ENDOFLATOR® performs the following self-tests when the supply voltage is switched on:

– **Flow booster**

If, when switched on, a flow of more than 0.75 l/min is measured (offset adjustment), the device emits an acoustic alert and the message 'Fl Err' appears on the display.

– **Pressure booster**

If, when switched on, a difference in pressure between the two independent pressure measuring channels of more than 1.5 mmHg is measured (offset adjustment), the device emits an acoustic alert and the message 'Pr Err' appears in the display.

In both cases, it is then only possible to start the device as normal in the hex display mode, see Section 5 Testing and Adjustments. The fault can then be rectified or an adjustment carried out.

To enable faults to be located quickly even with a closed housing, the ELECTRONIC ENDOFLATOR® has two test routines which can be selected by the user when the supply voltage is switched on:

– **Hex display mode**

If the supply voltage is switched on while the 'Start / Stop' button is pressed, the device branches into hex display mode. In this mode the output voltages of the four various boosters are displayed directly as a hex value, see Section 5 Testing and Adjustments. It is only possible to exit this mode by switching the supply voltage off and on again.

In addition to this monitoring, in normal operation the ELECTRONIC ENDOFLATOR® draws the user's attention to certain operating states through a visual / acoustic warning, without triggering any further action itself. These statuses are:

– **Warning 'Supply bottle empty'⁴⁾**

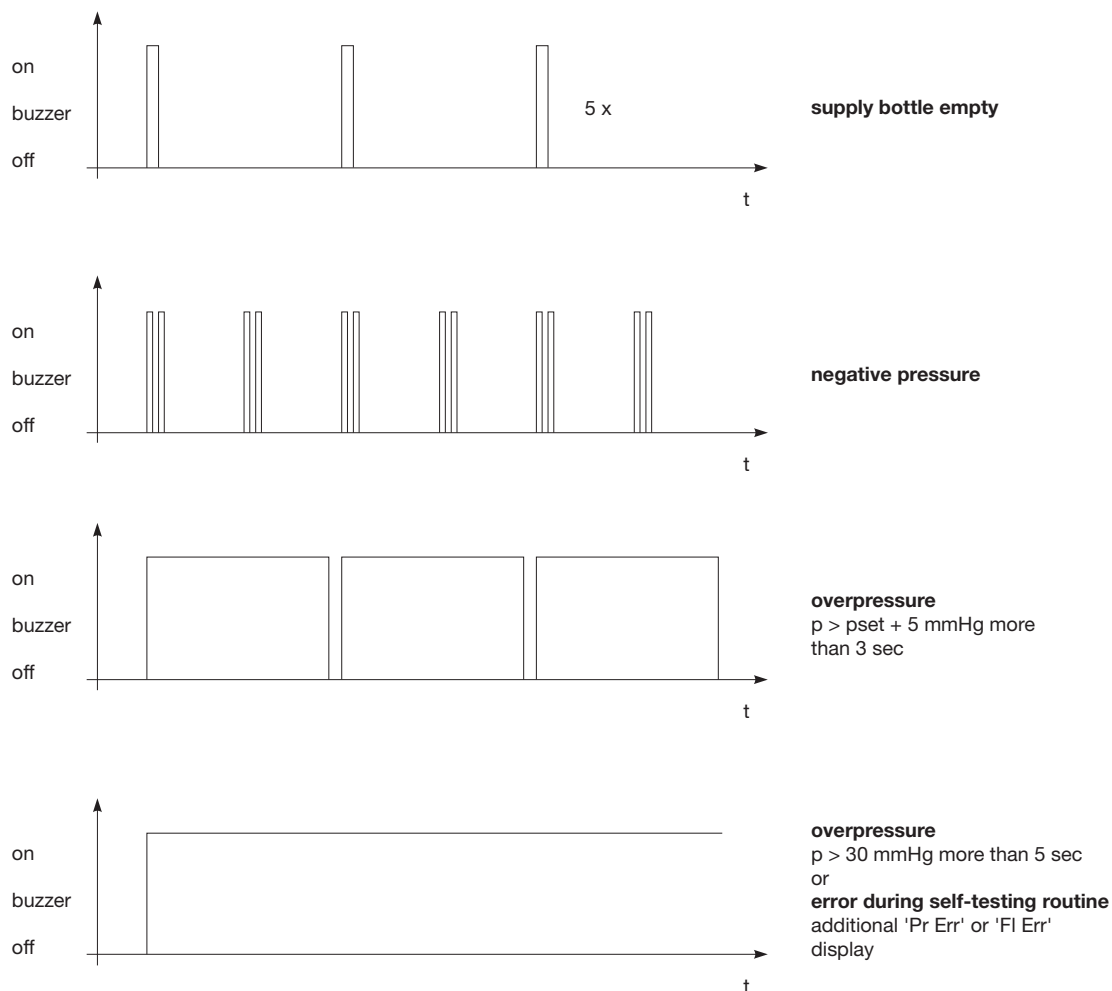
Five warning sounds at one-second intervals are given if the supply bottle is empty ($p < \text{approx. } 7 \text{ bar}$) when the 'Start' button is pressed. At the same time, the red LED in the gas bottle pressure gauge flashes.

– **Warning 'Negative pressure'**

If negative pressure is measured at the input, two brief warning sounds are given at one-second intervals. The warning continues until the measured pressure is again positive. This warning can also be taken as positive feedback: to illustrate, if, when the Veress needle is correctly positioned, the abdominal wall rises up and negative pressure arises in the abdomen.

⁴⁾ Applies only in the high supply pressure mode HiSup.

The following diagrams give an overview of the various warning sounds:



The warning sound volume can be set retroactively by authorized technical staff, but cannot be switched off, see Section 5 Testing and Adjustments.

The ELECTRONIC ENDOFLATOR® patient connection is designed to hold various different microfilters which prevent contamination of the device with patient fluid, thus removing a risk for the subsequent patient. For this reason, several of these filters are included in the standard accessories accompanying the device.

In order to prevent soiling from the supply side, a filter (75-100 micron) is used in the input stage of the pressure manifold. In addition, an external high pressure filter (0.5 micron) is optionally available. This is positioned between the supply bottle or the high pressure tube and the device.

The ELECTRONIC ENDOFLATOR® can prevent a dangerous increase in the patient pressure caused by external interferences (penetration of the operation environment, additional gas sources). This is made possible by the use of a separate blow off valve.

6.2 Safety checks

We recommend carrying out safety checks of the device at least once a year.

Work to be performed	Remarks
■ Visual inspection – Housing and accessories – Inscriptions, manufacturer's identification plate data – CE mark, KARL STORZ inspection label – Instruction manual – Power fuses – Fuse labels ■ Performance check⁵⁾ – Power switch – CO₂ bottle connector – Blow off valve – Setpoint bargraph displays – Setpoint digital displays – Buttons – LED self-test – HEX mode: bottle pressure (unpressurized) – HEX mode: sensors offset values – Operating mode: bottle pressure gauge – Bottle stand – Check flow (20 mmHg) – Pressure and control conduct (10 mmHg) – Check fall in pressure (≤ 3 mmHg / 15 s) – Service modes – Software alert – Hardware alert – Negative alert – Drawer for ready reference guide	externally undamaged correct, legible, clean, wipeable, securely attached fixed to the housing present correct ratings, undamaged, securely positioned, 2 x T 2.0 AL / 250 V (100 VAC ... 240 VAC) affixed beside the fuse holder, correct fuse ratings in perfect working order 2 green LEDs 21 – 10 – 21 present and in perfect working order (20 l/min. +20% / -10%), (16 l/min. +20% / -10%), (10 l/min. +20% / -10%), (3 l/min. $\pm 20\%$) or 2 display intervals (30 mmHg $\pm 10\%$), (15 mmHg +20% / -10%) (15 mmHg -20%) P1: gas supply modes, P2: LED self-test, P3: operating hours

N.C. = normal condition

S.F.C. = single fault condition

⁵⁾ To test for proper operation, see Section 5 Testing and Adjustments.

Work to be performed	Remarks
■ Electrical safety measurements¹⁾  (IEC 62353) – protective ground resistance: (with power cord) $\leq 0.3 \Omega$ – earth leakage current: $\leq 1.0 \text{ mA}$ – touch current: $\leq 0.5 \text{ mA}$ – patient leakage current: $\leq 0.5 \text{ mA}$ – patient leakage current: $\leq 5.0 \text{ mA}$ (supply voltage on the applied part) $\leq 5.0 \text{ mA}$ ■ Electrical safety measurements²⁾  (IEC 62353) – protective ground resistance: (with power cord) $\leq 0.3 \Omega$ – earth leakage current: $\leq 1.0 \text{ mA}$ – enclosure leakage current: $\leq 0.5 \text{ mA}$ – patient leakage current: $\leq 0.05 \text{ mA}$ – patient leakage current: (supply voltage on the applied part) $\leq 0.05 \text{ mA}$	

! **CAUTION:** *Servicing and Repairs may only be performed by qualified technicians trained in electrical or electronic engineering, in compliance with the relevant occupational, safety and accident prevention regulations.
Always unplug the device from the power supply before carrying out any repairs on it!*

1) Valid for devices up to serial no. 20424 (applied part type BF)
2) Valid for devices as from serial no. 20425-B (applied part type CF)

6.3 Safety devices



For further information about safety devices and instructions please see instruction manual.

6.4 Maintenance operations

Performance of preventive maintenance is not essential. Regular maintenance can, however, contribute to identifying potential problems before they become serious, thus enhancing the instrument's reliability and extending its useful operating life.

Maintenance services can be obtained from your local representative or from the manufacturer.

Regardless of the accident prevention regulations or testing intervals for medical instruments prescribed in different countries, we recommend a safety check of the device at least once a year.

6.5 Servicing and repair

Defective equipment should be serviced and repaired by factory trained technicians and replacement parts must be ordered from KARL STORZ.

Third party substitutions may result in noncompliance of this product with its original specifications.

KARL STORZ maintains a repair and replacement warehouse which is normally adequate to ensure prompt replacement of damaged telescopes and instruments. Under the repair and replacement plan, you receive an identical as-new instrument and are only charged the repair costs for the defective instrument. For telescopes, you receive a guarantee of 1 year, and for instruments 6 months.

For fiberscopes and equipment, individual repair is necessary. Usually to bridge the repair period, you will receive a device on loan which you then return to KARL STORZ as soon as you receive the repaired device.

In Germany you can refer repairs direct to

KARL STORZ GmbH & Co. KG
Repair Service Dept.
Dr. Karl-Storz-Str. 34
D-78532 Tuttlingen
Phone: +49 (0)7461 708-980
Fax: +49 (0)7461 708-404

In other countries please contact your local KARL STORZ branch or authorized dealer.

6.6 Fuse replacement



For detailed information please see instruction manual.

6.7 Cleaning and disinfection



For detailed information please see instruction manual.

Section 7.

Modifications and Supplements

Direction Sign:

- 1 ➤ Instruction Manual
- 2 ➤ Physical Design
- 3 ➤ Descriptions of Operation and Circuit Diagrams
- 4 ➤ Replacement of Individual Assemblies
- 5 ➤ Testing and Adjustments
- 6 ➤ Maintenance and Safety Checks

Appendix

➔ 8

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7.1 KARL STORZ-SCB® module

7.1.1. Description of KARL STORZ-SCB® module operation

The KARL STORZ-SCB® module is a universal interface which permits communication between KARL STORZ endoscopic devices for remote indication and control purposes.

The KARL STORZ-SCB® module is designed as an option for existing KARL STORZ devices and those manufactured in the future. As its intended use is in the medical field, it is designed in accordance with the requirements of the IEC 60601 standard. The module allows an instrument to be integrated into the KARL STORZ Communication Bus (KARL STORZ-SCB®) after customization of the module software.

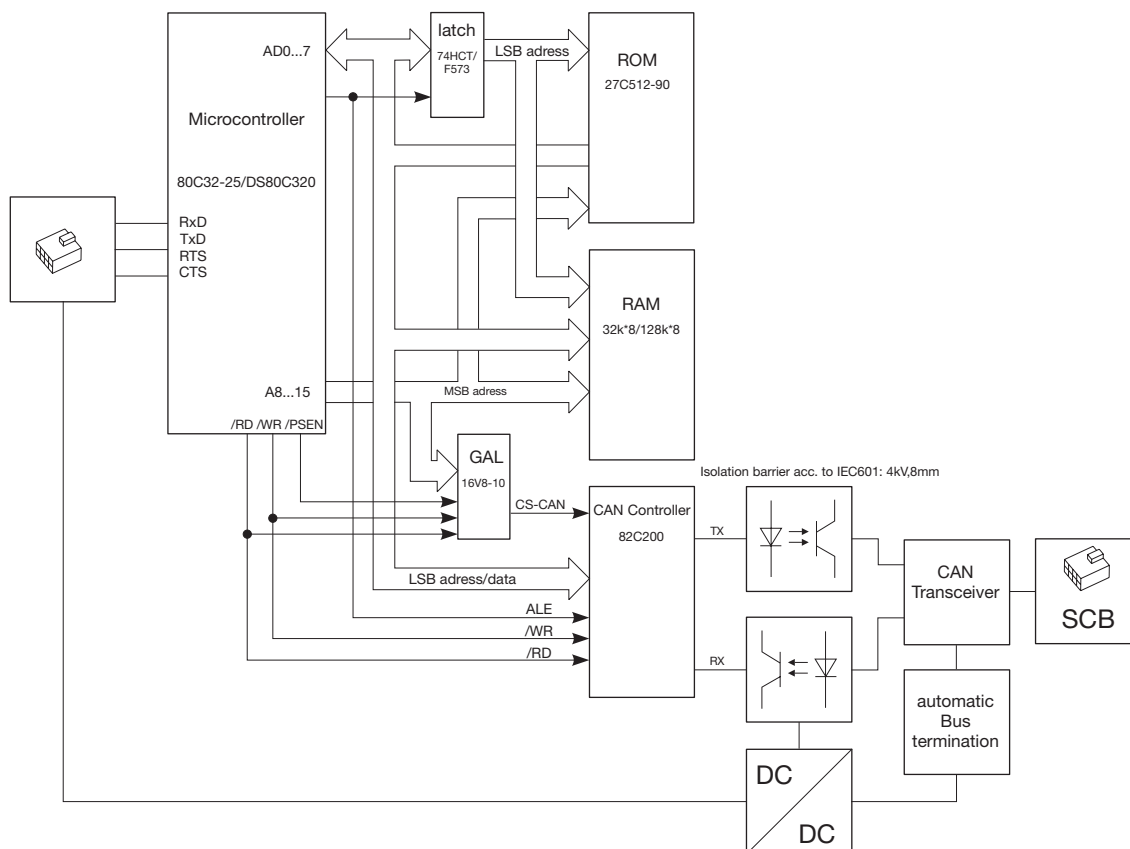
The module contains the following resources:

- 64 KB program memory
- 32 KB / 128 KB data memory
- microcontroller 80C32 or 80C320
- 22,1184 MHz oscillator frequency
- control trigger / resetting on power up
- independent CAN controller
- optically decoupled CAN transceiver
- automatic bus termination
- RS232 interface with hardware handshake
- 12 bit DIL switch for entering the serial number

KARL STORZ-SCB® Upgrade Kit for ELECTRONIC ENDOFLATOR®

Order no. 26 4305 77

7.1.2. Block diagram of the KARL STORZ-SCB® module



7.1.3. Notes to KARL STORZ-SCB® upgrade kit

- !** **CAUTION:** Prior to the installation of the KARL STORZ-SCB® upgrade kit the compatibility of the following modules has to be checked:
- software of the device
 - software of the KARL STORZ-SCB® module
 - RUI of the KARL STORZ-SCB® system
- Please contact the OR1™ service if necessary.

i **NOTE:** As from serial no. 10450-B a KARL STORZ-SCB® module is installed ex factory.

The installation of the KARL STORZ-SCB® upgrade kit consists of two steps:

- Installing the KARL STORZ-SCB® boards (module board and socket board)
- Replacing the EPROM and the microcontroller on the control board

i **NOTE:** The microcontroller has to be replaced only on devices with serial numbers up to 2899.

7.1.4. Installing the KARL STORZ-SCB® upgrade kit in the standard housing

7.1.4.1. Tools required for installing the KARL STORZ-SCB® upgrade kit in the standard housing

Side cutters	
Slot head screwdriver, size 4	
Torx key 8	Order no. 5610512
Torx key 20	Order no. 5625112
Conductive work mat, wrist band, ground cable	

- !** **CAUTION:** Always unplug the device from the power supply before carrying out any repairs on it! To prevent damage to the components caused by the build-up of electrostatic charges, we recommend that you connect yourself to ground via the wristband throughout servicing. After servicing, a safety test, the leakage current and protective ground resistance measurements according to IEC 62353, IEC / UL 60601-1, CAN / CSA C22.2 NO 601.1, whichever may apply, are to be carried out.



7.1.4.2. Installing the KARL STORZ-SCB® boards in the standard housing

Insert a screwdriver into the recess at the rear of the side cover and lift the cover out towards the front.

(Slot head screwdriver, size 4)



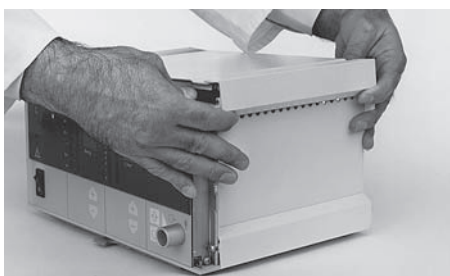
Undo the two screws located under the side cover on the front of the device.

(Torx key 20)



Undo the two corresponding screws on the rear of the device.

(Torx key 20)



To release the housing cover, press the side rail upward.



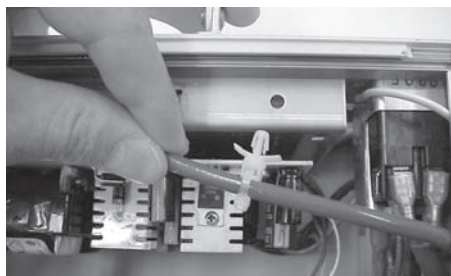
The housing cover can then be pulled off to the right.



To release and remove the base plate, follow the same procedure as for releasing the housing cover.



Remove both DBI plugs from the back panel.



Press out the holder for cable ties from the power supply mount at the bottom left (otherwise it will be in a block when installing the KARL STORZ-SCB® socket board).



Insert the complete KARL STORZ-SCB® socket board from above to the side of the power supply mount.

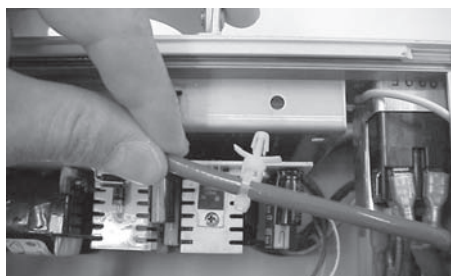


CAUTION: If the two recesses for the KARL STORZ-SCB® socket board at the rear panel are too small in diameter, the diameters must be increased on 12.6 mm!



Secure the KARL STORZ-SCB® socket board by screwing it tight with the four screws supplied.

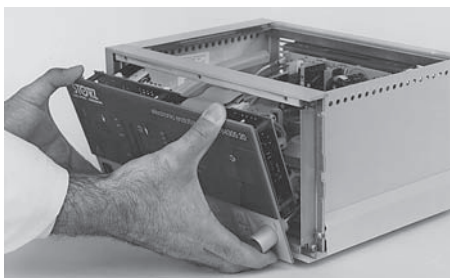
(Torx key 8)



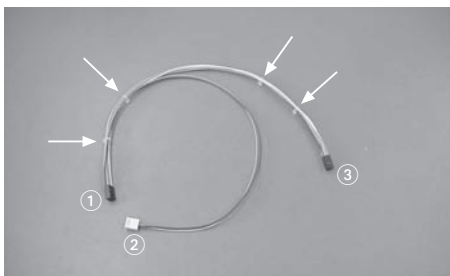
Refit the holder for cable ties from the power supply mount at the bottom left.



Pull out the two bayonet mounts (sliding bolts) of the front panel sideways using a screwdriver or the like.

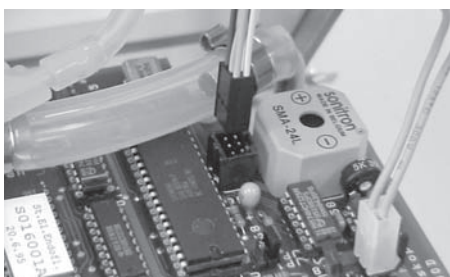


Remove the front panel from the front.

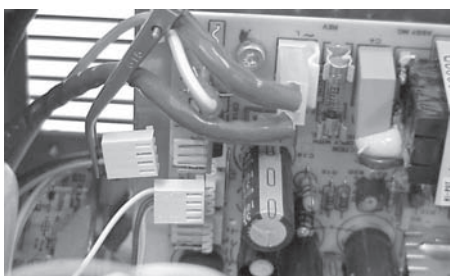


Prepare the connection cords with four cable ties (see arrows).

- ① Connection to KARL STORZ-SCB® board, X100
- ② Connection to power supply, JP3 or connection to adapter board of the power supply (type MZP-9561-M), X2
- ③ Connection to control board, P9

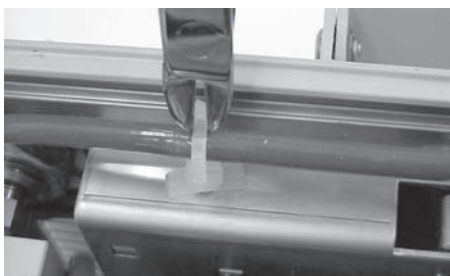


Plug the 6-pin connector ③ of the connecting cord into the socket (P9) on the control board.



Plug the 4-pin connector ② of the connecting cord into the socket (JP3 or X2) on the power supply.

NOTE: Since November 2003 a new power supply type MZP-9561-M with adapter board is used. There the 4-pin connector has to be plugged in at X2 on the adapter board.



Remove both cable ties from the power supply mount at the bottom.

(Side cutters)



Secure the black and red cable with two new cable ties.

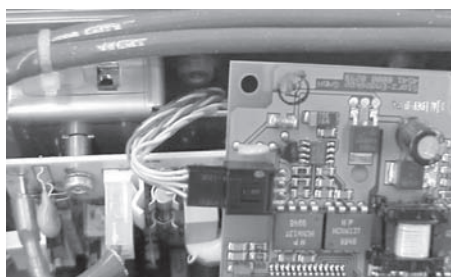


Secure the black and red cable to the supply line using a cable tie.



Undo the two securing screws on the power supply mount.

(Torx key 20)

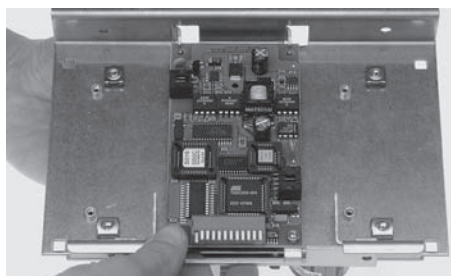


Plug the KARL STORZ-SCB® connectors into the KARL STORZ-SCB® module board.

Carefully insert the KARL STORZ-SCB® board approx. half way into the recess of the power supply mount.



Plug the connecting cable connectors ① into the KARL STORZ-SCB® module board. Fit the complete KARL STORZ-SCB® module board.



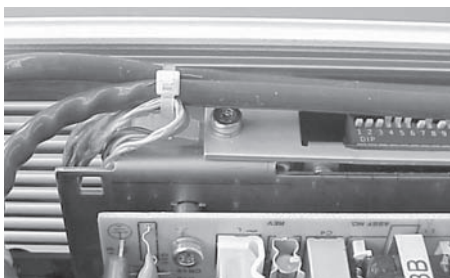
! **CAUTION:** The KARL STORZ-SCB® module board must be engaged correctly in the recess of the power supply mount.



Secure the KARL STORZ-SCB® module board to the power supply mount by screwing it tight.

(Torx key 20)

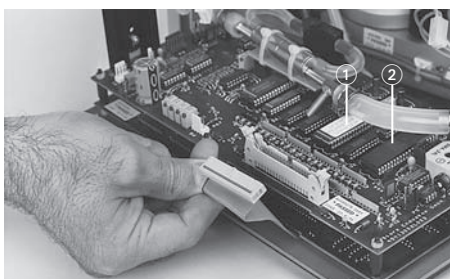
! **CAUTION:** It is essential to ensure that the KARL STORZ-SCB® cables and power supply cord are not trapped between the KARL STORZ-SCB® module board and the power supply mount.



Secure the cables of the KARL STORZ-SCB® socket board with the power supply lines.

7.1.4.3. Replacing the EPROM and the microcontroller

- NOTE:** The microcontroller has only to be replaced on devices with serial numbers up to 2899.
To ensure the compatibility between the software of the device and the software of the KARL STORZ-SCB® module, the EPROM has always to be replaced.

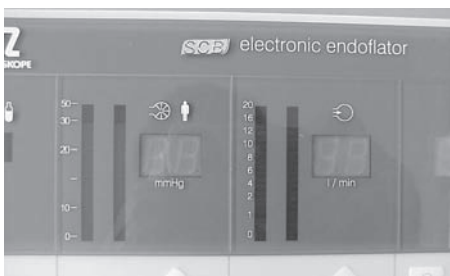


Replace the EPROM U3 ① and if necessary the microcontroller U1 ②.

- CAUTION:** Ensure that the EPROM and the microcontroller are installed in the correct positions (recess). Avoid bending or kinking the pins!
- NOTE:** Check the functions of the device after replacing the EPROM and the microcontroller and, if necessary, carry out a readjustment, see Section 5 Testing and Adjustments.

To assemble, proceed in the reverse order.

- NOTE:** In order to avoid connecting up the assemblies incorrectly when assembling, refer to Section 3.3 Wiring diagram of the ELECTRONIC ENDOFLATOR®.



Affix the KARL STORZ-SCB® adhesive label to the front panel.

STORZ KARL STORZ — ENDOSKOPE	
Model : 264305 20 -1 Voltage : 100 - 240 V~ Frequency : 50 / 60 Hz Power : 250 VA	Mittelstrasse 8 D-78532 Tuttlingen Germany Classification IEC: Class I Gas: CO 2 0123

Complete the model number on the manufacturer's identification plate on the underneath of the device by entering '-1' (26 4305 20-1).

- NOTE:** To guarantee the functionality of two or more identical devices in the KARL STORZ-SCB®, please see the settings in Section 7.2 Functionality of two or more identical devices in the KARL STORZ-SCB®.

7.1.5. Installing the KARL STORZ-SCB® upgrade kit in the new system housing

7.1.5.1. Tools required for installing the KARL STORZ-SCB® upgrade kit in the new system housing

Hexagonal socket wrench, size 5.5

Side cutters

Slot head screwdriver, size 4

Torx key 8

Torx key 20

Wrench, size 5.5

Order no. 5610512

Order no. 5625112

Conductive work mat, wrist band, ground cable



CAUTION: *Always unplug the device from the power supply before carrying out any repairs on it! To prevent damage to the components caused by the build-up of electrostatic charges, we recommend that you connect yourself to ground via the wristband throughout servicing. After servicing, a safety test, the leakage current and protective ground resistance measurements according to IEC 62353, IEC / UL 60601-1, CAN / CSA C22.2 NO 601.1, whichever may apply, are to be carried out.*



7.1.5.2. Installing the KARL STORZ-SCB® boards in the new system housing

NOTE: The new system housing is used in devices with serial no. 7550-B and higher.

Undo the screws on the underneath of the device.

(Torx key 10)



Insert a screwdriver into the recess at the rear of the side cover and lift the cover out towards the front.

(Slot head screwdriver, size 4)



Remove both DBI plugs from the back panel.



Pull the housing cover off toward the rear.



Remove both cable ties from the power supply mounts.

(Side cutters)



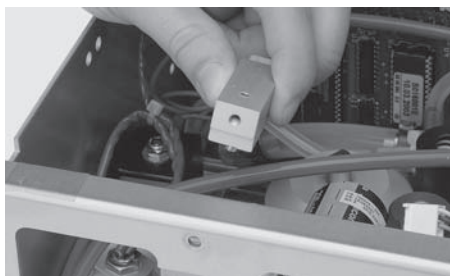
Remove all cable connections from the power supply.

NOTE: Due to a component recovery the power supply has been changed. The currently used power supply is model 200102 82. Therefore differences could appear between this manual and your ELECTRONIC ENDOFLATOR®. If you are in doubt please contact service.

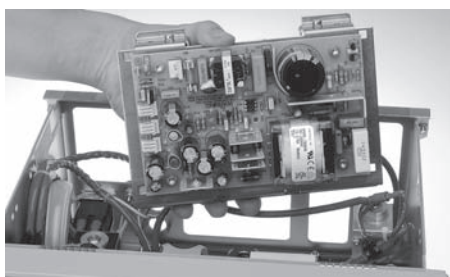


Remove both screws at the power supply mounts.

(Torx key 20)



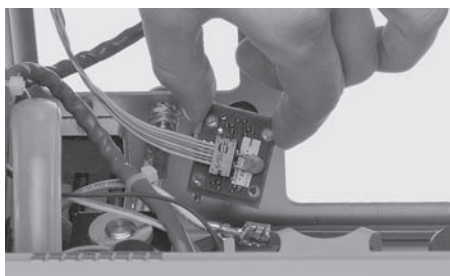
Remove both power supply mounts.



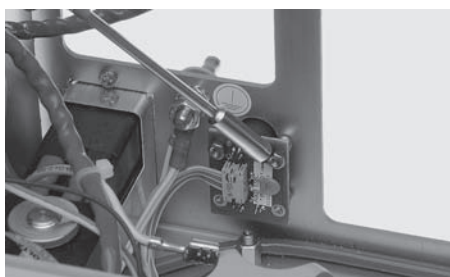
Take the power supply off the housing.



Attach the four distance shells for the new system housing onto the bolts for the KARL STORZ-SCB® socket board.

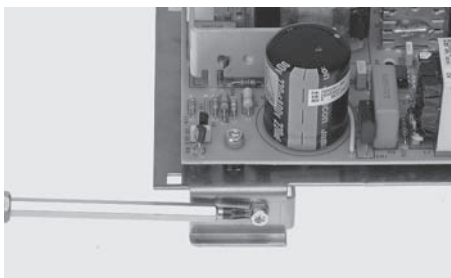


Attach the KARL STORZ-SCB® socket board onto the bolts.



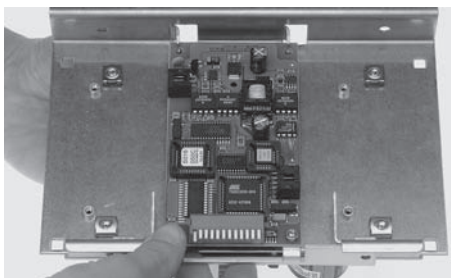
Fix the KARL STORZ-SCB® socket board with the four included nuts.

(Hexagonal socket wrench, size 5.5 or wrench, size 5.5)



Remove both screws at the power supply mounts.

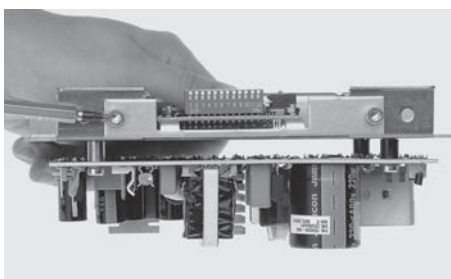
(Torx key 20)



Insert the KARL STORZ-SCB® module board in the power supply mount.

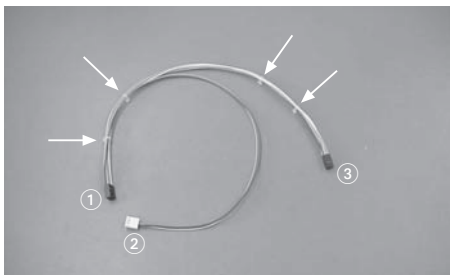


CAUTION: The KARL STORZ-SCB® module board must be engaged correctly in the recess of the power supply mount.



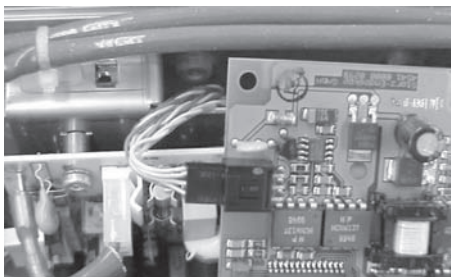
Screw the KARL STORZ-SCB® module board on the power supply mount.

(Torx key 20)

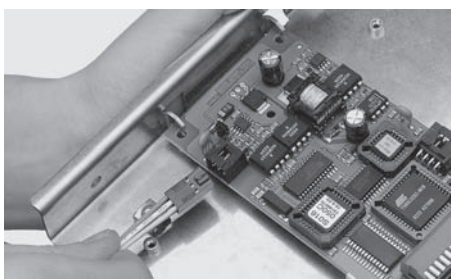


Prepare the connection cords with four cable ties (see arrows).

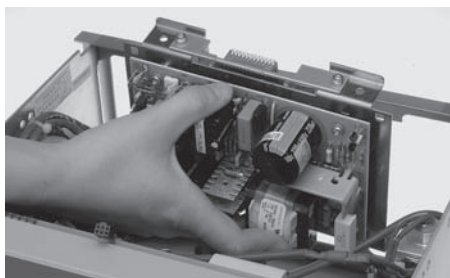
- ① Connection to KARL STORZ-SCB® board, X100
- ② Connection to power supply, JP3 or connection to adapter board of the power supply (type MZP-9561-M), X2
- ③ Connection to control board, P9



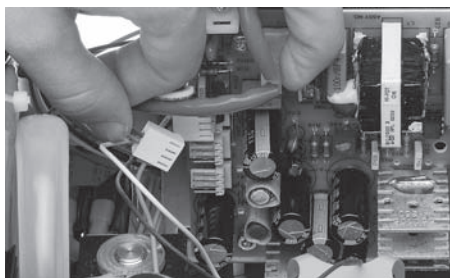
Plug the KARL STORZ-SCB® connectors into the KARL STORZ-SCB® module board.



Plug the connecting cable connectors ① into the KARL STORZ-SCB® module board. Fit the complete KARL STORZ-SCB® module board.

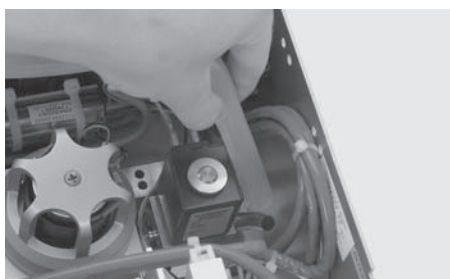


Re-insert the power supply into the housing.



Plug all cable connections into the power supply.
Thereby plug the 4-pin connector ② of the connecting cord into the socket (JP3 or X2) on the power supply.

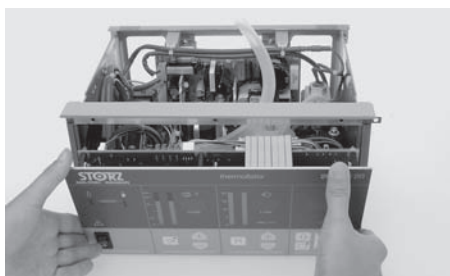
i NOTE: Since November 2003 a new power supply type MZP-9561-M with adapter board is used. There the 4-pin connector has to be plugged in at X2 on the adapter board.



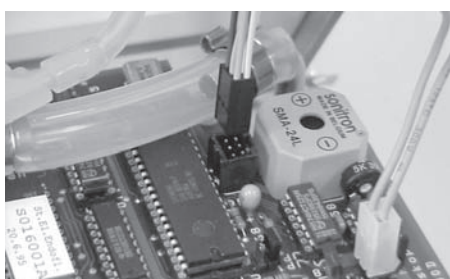
Remove the tube connection gas flow splitter / solenoid valve from the solenoid valve.



Pull out the two bayonet mounts (sliding bolts) of the front panel side-ways using a screwdriver or the like.



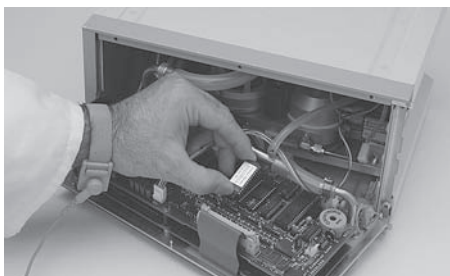
Remove the front panel from the front.



Plug the 6-pin connector ③ of the connecting cord into the socket (P9) on the control board.

7.1.5.3. Replacing the EPROM

NOTE: To ensure the compatibility between the software of the device and the software of the KARL STORZ-SCB® module, the EPROM has always to be replaced.



The EPROM U3 on the control board can now be replaced.

CAUTION: Ensure that the EPROM and the microcontroller are installed in the correct positions (recess). Avoid bending or kinking the pins!

NOTE: Check the functions of the device after replacing the EPROM and, if necessary, carry out a readjustment, see Section 5 Testing and Adjustments.

To assemble, proceed in the reverse order.

NOTE: In order to avoid connecting up the assemblies incorrectly when assembling, refer to Section 3.3 Wiring diagram of the ELECTRONIC ENDOFLATOR®. It must be checked that the protective grounding on the rear panel is properly secured in accordance with IEC 60601-1 by carrying out a visual inspection and electrical test.



Affix the KARL STORZ-SCB® adhesive label to the front panel.

STORZ KARL STORZ — ENDOSKOPE	
Model : 264305 20 -1	Mittelstrasse 8
Voltage : 100 - 240 V~	D-78532 Tuttlingen
Frequency : 50 / 60 Hz	Germany
Power : 250 VA	Classification IEC:
	Class I
	Gas: CO 2

Complete the model number on the manufacturer's identification plate on the underneath of the device by entering '-1' (264305 20-1).

NOTE: To guarantee the functionality of two or more identical devices in the KARL STORZ-SCB®, please see the settings in Section 7.2 Functionality of two or more identical devices in the KARL STORZ-SCB®.

7.2 Functionality of two or more identical devices in the KARL STORZ-SCB®

As from the R-UI version 20090001S243 the KARL STORZ-SCB® R-UI system allows two or more identical devices of the same type to be operated in the KARL STORZ-SCB® network and centrally controlled from the R-UI. Up to three devices can be operated from the R-UI. The precondition is that these devices have different serial numbers.

You will find detailed information on the functionality of two or more identical devices in the KARL STORZ-SCB® system instruction manual (Section 6 Identical Devices on the SCB).

To guarantee the functionality of two or more identical devices in the KARL STORZ-SCB®, the following settings must be made after installing the KARL STORZ SCB® upgrade kit.

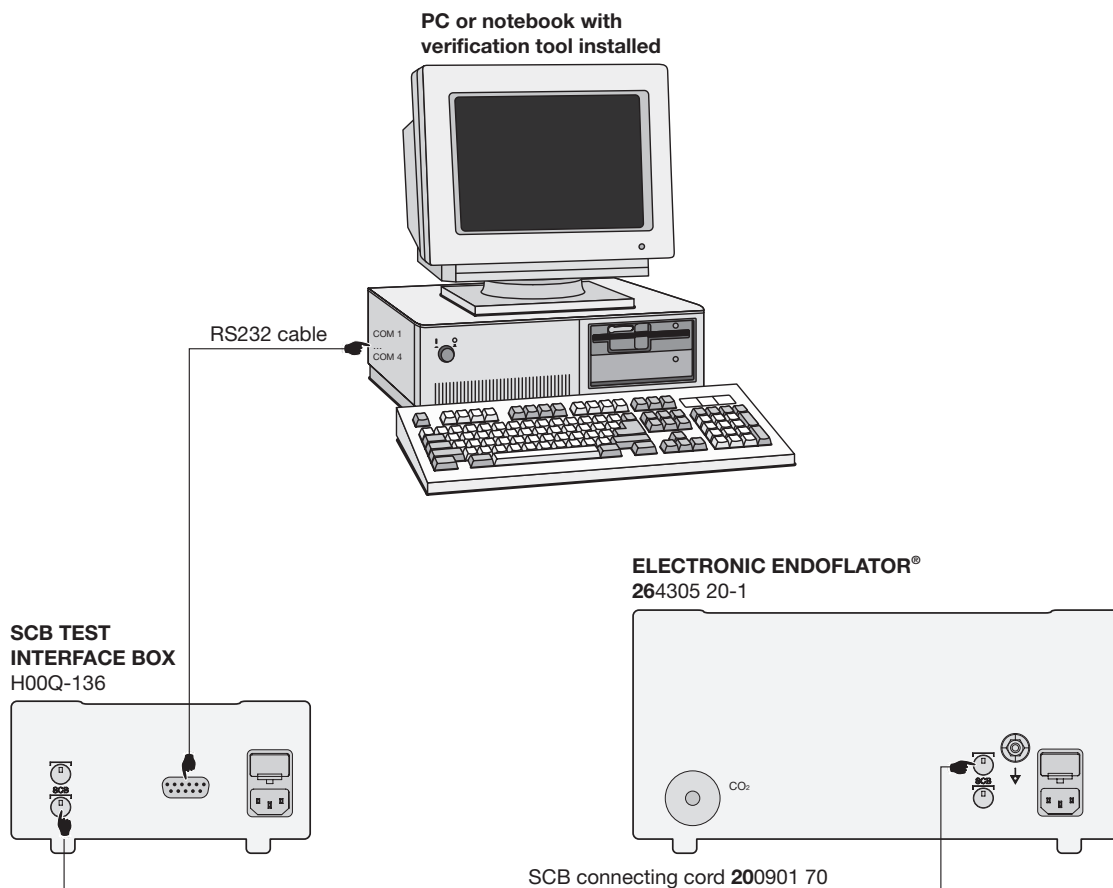
- readjusting the serial no.
- sticking the corresponding number sticker to the front panel

7.2.1. Tools required for readjusting the serial number

The serial no. can be readjusted with the aid of the KARL STORZ-SCB® test interface box (H00Q-136), the verification tool contained in this package and a conventional PC or notebook.

7.2.2. System design for readjusting the serial number

Connect the devices to each other as shown in the illustration.



7.2.3. Installation of the SCB Service Tool

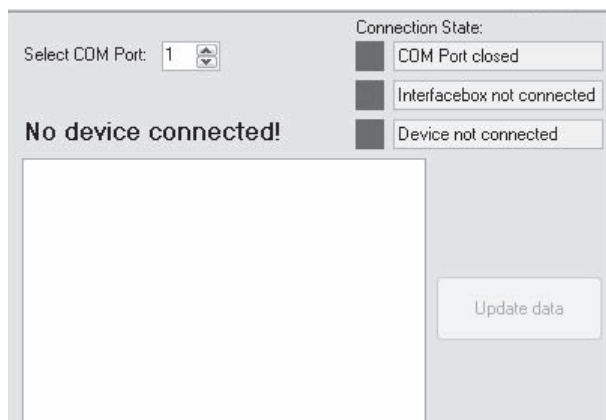
i NOTE: The SCB Service Tool can be used in conjunction with the operating systems
Windows® 2000 (min. Service Pack 3) or Windows® XP (min. Service Pack 2).

i NOTE: Before copying the files, we recommend that you create a directory for this purpose on your hard drive.

Copy the folder **STORZ SCB Service Tool** onto your hard drive.

Remove the write protection from the files you have copied onto your hard drive.

Create a shortcut to the file **SCB_Service_Tool.exe** and rename it **SCB Service Tool**. Copy the shortcut into the program directory of the Start menu on your PC or notebook.

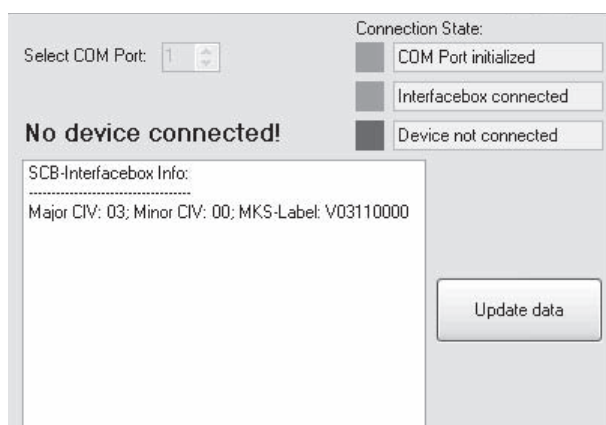


7.2.4. Adjustment of the serial number

Ensure that the system was connected as shown in *Section 7.2.2 System design for adjusting the serial number*.

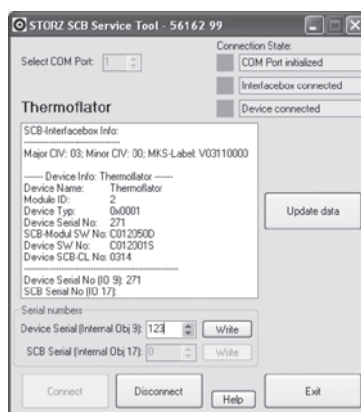
Open the SCB tool by clicking on **Start – Programs – SCB Service Tool**.

The window **SCB Service Tool - 5616299** opens.



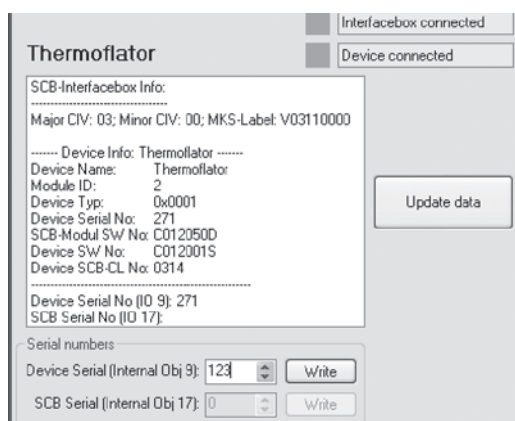
Switch on the KARL STORZ-SCB® test interface box (H00Q-136).

The KARL STORZ-SCB® test interface box reports to the SCB Service Tool.



Switch on the ELECTRONIC ENDOFLATOR® 26 4305 20-1. The ELECTRONIC ENDOFLATOR® reports to the SCB Service Tool.

The device-specific data are read out and displayed.



In the area **Serial numbers** the currently programmed serial number is displayed as **Device Serial**.

Device Name: Thermoflator
Module ID: 2
Device Typ: 0x0001
Device Serial No: 271
SCB-Modul SW No: C012050D
Device SW No: C012001S
Device SCB-CL No: 0314

.....
Device Serial No (IO 9): 271
SCB Serial No (IO 17):

Serial numbers

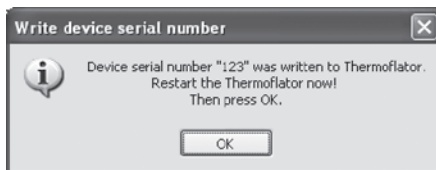
Device Serial (Internal Obj 9): 123

Write

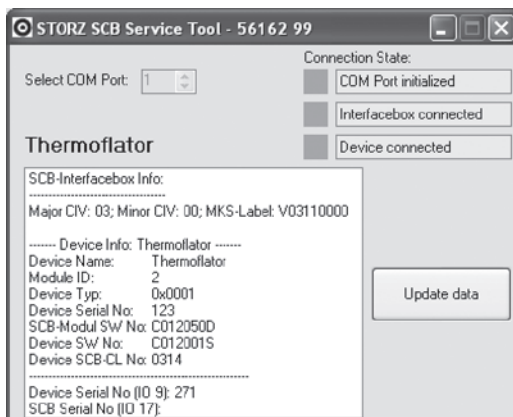
SCB Serial (Internal Obj 17): 0

Write

Enter the desired serial number as **Device Serial** and click on the **Write** button.



The window **Write device serial number** opens to confirm the adjustment of the serial number.



Close the SCB Service Tool and switch off the ELECTRONIC ENDOFLATOR® and the KARL STORZ-SCB® test interface box.



7.2.5. Sticking on the ID number sticker

Attach the corresponding sticker ('#1', '#2' or '#3') beside the KARL STORZ-SCB® symbol on the front panel after you have allocated the ID numbers in the KARL STORZ-SCB®.

NOTE: Please see the KARL STORZ-SCB® system instruction manual (Section "Identical devices on the SCB") for detailed information on the functionality of two or more identical devices in the KARL STORZ-SCB®.

7.3 Upgrade kit for power supply unit model 200102 82

The upgrade kit for the power supply unit consists of:

- power supply unit, 60 W
- adapter board
- fixing plate
- eight securing screws
- conversion instructions

7.3.1. Tools required for replacing the power supply unit

Side cutters

Slot head screwdriver, size 4

Torx key 10

Torx key 20

Torx key 25

Wrench, size 12

Order no. 5610612

Order no. 5625112

Order no. 5625212

Conductive work mat, wristband, ground cable



CAUTION: Always unplug the device from the power supply before carrying out any repairs on it! To prevent damage to the components caused by the build-up of electrostatic charges, we recommend that you connect yourself to ground via the wristband throughout servicing. After servicing, a safety test, the leakage current and protective ground resistance measurements according to IEC 62353, IEC / UL 60601-1, CAN / CSA C22.2 NO 601.1, whichever may apply, are to be carried out.



7.3.2. Replacing the power supply unit in the standard housing

7.3.2.1. Removing the power supply unit

Insert a screwdriver into the recesses at the rear of the side covers and lift the covers off toward the front.

(Slot head screwdriver, size 4)



Undo the screws under the side covers on the front of the device.

(Torx key 20)



Undo the corresponding screws on the rear of the device.

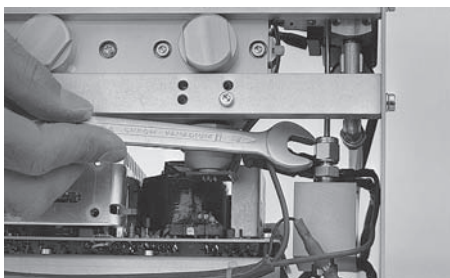
(Torx key 20)



To release the housing cover, press the side strip upward, then raise the housing cover and pull it off sideways.
Remove both side strips.

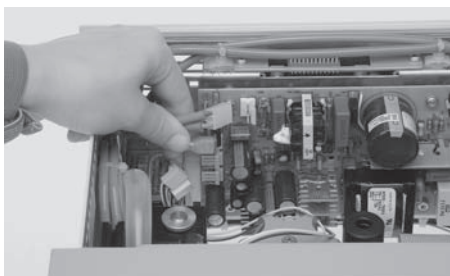


To release the base of the housing, turn the device upside down and press the side strip upward, then raise the base and pull it off sideways.
Remove both side strips.



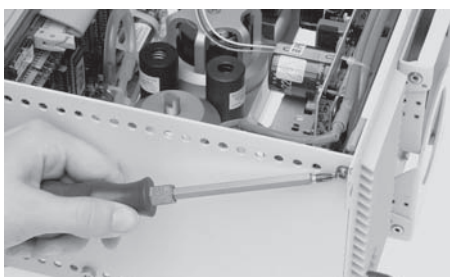
Release the internal high pressure line from the gas preheater.

(Wrench, size 12)



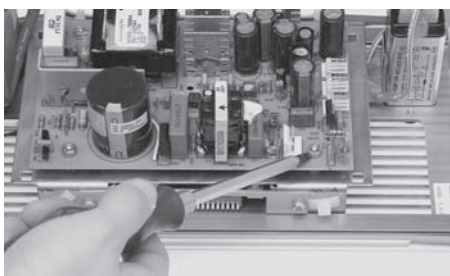
Remove all the cable connections and any attached cable ties from the power supply unit.

(Side cutters)



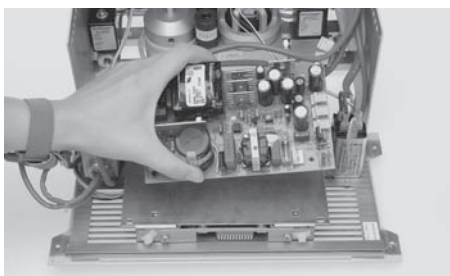
Undo the four screws which secure the rear panel to the side panels, and fold down the rear panel.

(Torx key 20)



Undo the four screws that fix the power supply unit to the power supply mount.

(Torx key 20)



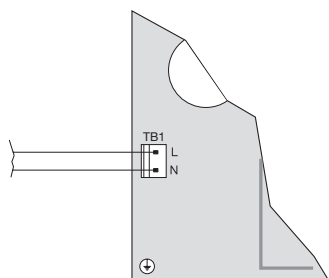
Remove the power supply unit.



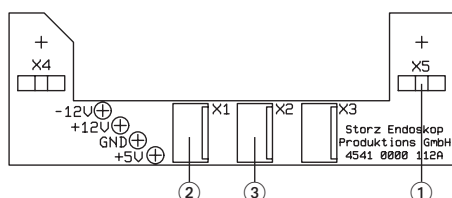
7.3.2.2. Installing the upgrade kit

Secure the fixing plate of the power supply unit to the power supply mount with the four M4 countersunk head screws supplied.

(Torx key 20)



Connect the cable from the power switch to the power supply unit connector TB1.



Connect the cables to the connectors X1, X2 and X5 of the adapter board.

- ① Adapter board X5 to grounding terminal
- ② Adapter board X1 to KARL STORZ-SCB® module board, connector X100, if KARL STORZ-SCB® module board has been installed
- ③ Adapter board X2 to control board, connector P1

To assemble, proceed in the reverse order.

NOTE: It must be checked that the protective grounding on the rear panel is properly secured in accordance with IEC 60601-1 by carrying out a visual inspection and electrical test.

7.3.3. Replacing the power supply unit in the new system housing

7.3.3.1. Removing the power supply unit

NOTE: The new system housing is used in devices with serial no. 7550-B and higher.

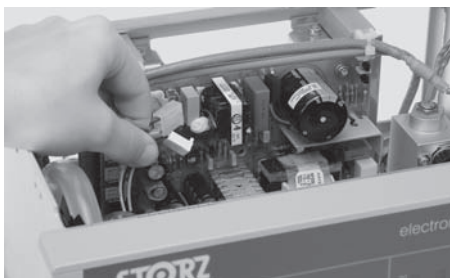


Undo the four screws on the underneath of the device.

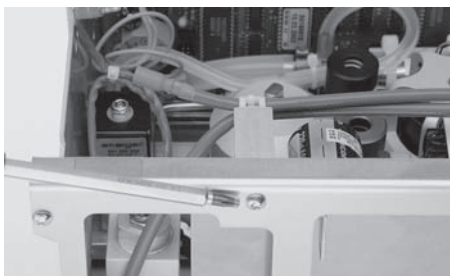
(Torx key 10)



Pull the housing cover off toward the rear.

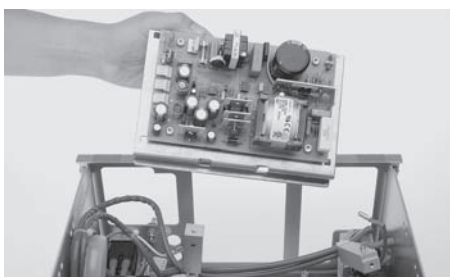


Remove all cable connections from the power supply unit.

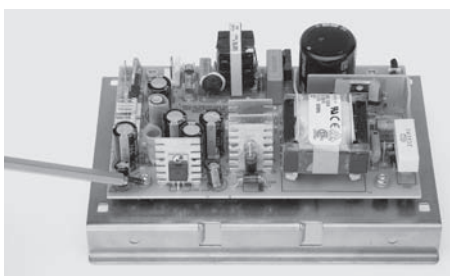


Undo the two screws that fix the two retaining bolts of the power supply mount on the rear panel.

(Torx key 20)

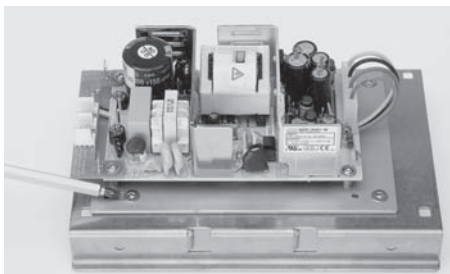


The power supply unit and mount can now be removed upwards.



Undo the four screws that fix the power supply unit to its mount.

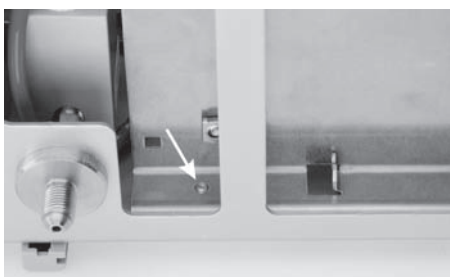
(Torx key 20)



7.3.3.2. Installing the upgrade kit

Secure the fixing plate of the power supply unit to the power supply mount with the four M4 countersunk head screws supplied.

(Torx key 20)

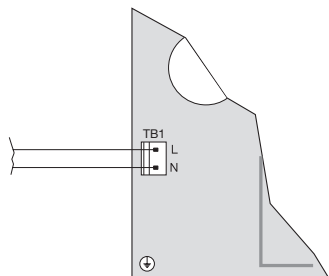


Replace the power supply mount on the two bolts on the base of the housing.

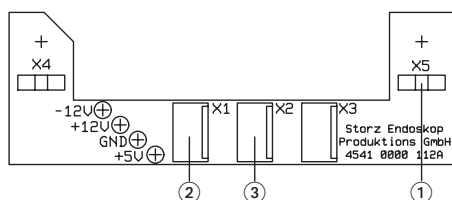


Insert the shanks of the two retaining bolts into the holes provided in the power supply mounting and resecure both bolts on the rear panel.

(Torx key 20)



Connect the cable from the power switch to the power supply unit, connector TB1.



Connect the cables to the connectors X1, X2 and X5 of the adapter board.

- ① Adapter board X5 to grounding terminal
- ② Adapter board X1 to KARL STORZ-SCB® module board, connector X100, if KARL STORZ-SCB® module board has been installed
- ③ Adapter board X2 to control board, connector P1

To assemble, proceed in the reverse order.

NOTE: It must be checked that the protective grounding on the rear panel is properly secured in accordance with IEC 60601-1 by carrying out a visual inspection and electrical test.

7.4 Software versions

7.4.1. Software version S016001D

The software version S016001D⁶⁾ concerns the following points:

– **Setpoint confirmation**

After being switched on, the device awaits confirmation or modification of the most recently used setpoints. This is signified by the corresponding LEDs flashing in the bargraph displays. The LED in the 'Start / Stop' button also flashes.

To confirm both setpoints press the '+' or '-' button or the 'Start / Stop' button once.

After confirmation of the setpoints, the LED in the 'Start / Stop' button goes out and the LEDs in the bargraph display are continuously illuminated. Pressing the 'Start / Stop' button next starts insufflation.

– **Operation with Veress needle with high flow rates**

Despite information to the contrary in the instruction manual, the ELECTRONIC ENDOFLATOR® is used with setpoints far exceeding 1 l/min for creating the pneumoperitoneum.

Due to the elasticity and volume of the insufflation tube, this leads to inaccuracies in the pressure gauge.

The ELECTRONIC ENDOFLATOR® now checks using several specific indicators (pressure rise speed, current position in filler insert, current flow rate etc.) whether these operating conditions are provided and adjusts the pressure measuring procedure accordingly.

i NOTE: *This change has no effect on the normal means of operation. The adjusted pressure measuring procedure merely sets a slightly lower than usual flow. As this is only the case in insufflation through small openings with high flow setpoint, this effect is negligible.*

Checking for the stated operating conditions occurs continuously, i. e. when the tube is taken from the Veress needle and inserted into the trocar the normal conditions return.

– **KARL STORZ-SCB® (KARL STORZ Communication Bus) support**

The device can be optionally extended by the KARL STORZ-SCB® port by equipping it with the KARL STORZ-SCB® module (order no. 264305 77). The function of this port is described in Section 7.1 KARL STORZ-SCB® module.

⁶⁾ Software version S016001D is not the current one. See following sections for more information.

7.4.2. Software version S016001E

NOTE: This software version includes all the changes and improvements of the software versions before.

The software version S016001E⁷⁾ concerns the following points:

NOTE: This software version is included ex factory as from serial no. 5050.

– Introduction of two different gas supply modes

The ELECTRONIC ENDOFLATOR® is often operated at central gas supplies with pressures less than 7 bar. Until now, this triggered a device warning, since the pressure recording system of the device interpreted this as an 'empty' high pressure bottle.

With the software upgrade, the ELECTRONIC ENDOFLATOR® can now differentiate between two different supply modes:

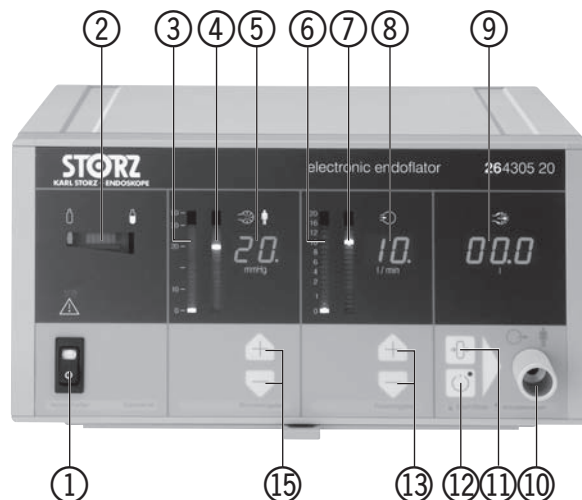
- high pressure and
- low pressure

The desired mode is set in service program P1 and remains stored even after the device is switched off. The default setting set as standard in the factory is the high pressure mode.

– High pressure mode

The high pressure mode is the same as that which existed up to now. If the supply bottle is empty or during operation at low pressure supply, the left red LED in the supply display ② flashes and a warning sound is provisionally given when insufflation is started.

When operating on the KARL STORZ-SCB® system a corresponding warning message is displayed continuously on the PC or video monitor. When operating at a low pressure supply, the device nevertheless continues to function fully.



– Low pressure mode

In this mode the right green LED in the supply display ② is continuously lit up. A 'bottle empty' warning does not exist here.

NOTE: If the device is connected to high pressure supply in this mode, it automatically switches to high pressure mode. However, this switch-over only applies until the supply voltage is switched off. The next time the device is switched on, it starts in the mode in which it was programmed.

⁷⁾ Software version S016001E is not the current one. See following sections for more information.

– Service programs P1, P2

– Calling up service programs

To do so, press down the 'Volume Reset' button (11) when switching on the device.

The display P1 (program 1) appears for approx. one second. Then the current gas supply mode is displayed with HiSuP (high supply pressure) or LoSuP (low supply pressure).

– Changing the mode

Pressing the '+' or '-' button (13) for the flow changes the mode.

– Changing the program

Pressing the '+' button (15) for the pressure changes to the next program P2 (LED test program). The display P2 (program 2) appears for approx. one second. Then the LED test program enters the end-less loop.

With the '-' button (15) for the pressure, the device can be changed to the previous program P1.

– Saving the mode or exiting service programs

To do so, switch off the device. Entries made by the user are stored permanently.

– Other

When the user confirms the setpoints a brief beep is given. The sound is emitted upon confirmation using the device buttons and also upon confirmation via the KARL STORZ-SCB® system.

7.4.3. Software version C016001F

i NOTE: This software version includes all the changes and improvements of the software versions before.

i NOTE: This software version is included ex factory as from serial no. 9499-B.

The software version C016001F⁸⁾ concerns the following points:

– Filling algorithm

In order to obtain a constant pressure indication when operating with the Veress needle, the filling algorithm has been changed.

With a detected Veress needle, the interval has been extended to 0.7 seconds with gas flow = 0 up to the start of pressure measuring. This means that the insufflation tube can be emptied via a small needle opening even under unfavorable circumstances. The result is a considerably steadier pressure indication when operating with the Veress needle.

– Insufficient supply pressure (high pressure mode)

If the gas in the connected CO₂ cylinder is expended, a continuous acoustic warning signal sounds as soon as insufflation is started (three warning sounds at 0.5 second intervals).

i NOTE: This does not apply to low pressure gas supply mode.

– High pressure in the patient line

As soon as the intra abdominal pressure exceeds the current setpoint by more than 5 mmHg for more than 3 seconds, a continuous acoustic warning signal sounds (alternating short and long sounds) and the gas intake is stopped. After a further 1.5 seconds, the overpressure is actively released via a blow off valve.

8) Software version C016001F is not the current one. See following sections for more information.

7.4.4. Software version C016001H

NOTE: This software version includes all the changes and improvements of the software versions before.

NOTE: This software version is included ex factory as from serial no. 11010-B.

The software version C016001H⁹⁾ has been implemented to optimize the device's functions, especially in connection with KARL STORZ-SCB®.

For proper KARL STORZ-SCB® communication the firmware on the KARL STORZ-SCB® hardware module must be updated as well.

7.4.5. Software version C016001J

NOTE: This software version includes all the changes and improvements of the software versions before.

NOTE: This software version is included ex factory as from serial no. 13100-B.

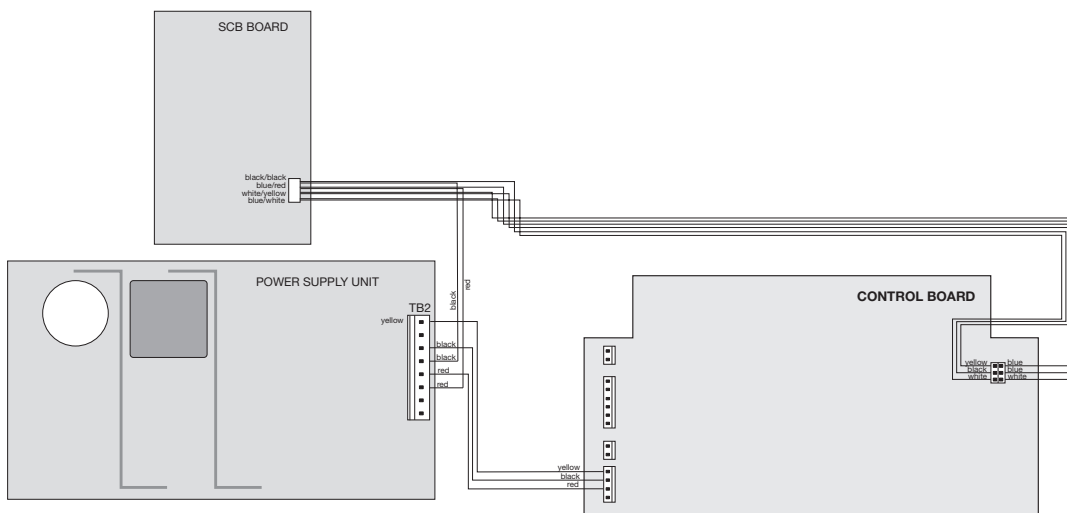
The software version C016001J¹⁰⁾ has been implemented to optimize the device's functions, especially in connection with the storage of the setpoints.

9) Software version C016001H is not the current one. See following sections for more information.

10) The current software version at the time of service manual printing has been C016001J.

7.5 Replacing the utility line up to serial number CBxxxxx

To eliminate the in rare cases occurring issue of devices signing off or on to SCB sporadically, devices as from serial number CBxxxx were equipped with a new utility line (Order-No A016-507). Devices up to serial number CBxxxx the utility line can be exchanged.



Section 8.

Appendix

Direction Sign:

- 1 ➡ Instruction Manual
- 2 ➡ Physical Design
- 3 ➡ Descriptions of Operation and Circuit Diagrams
- 4 ➡ Replacement of Individual Assemblies
- 5 ➡ Testing and Adjustments
- 6 ➡ Maintenance and Safety Checks
- 7 ➡ Modifications and Supplements

KARL STORZ GmbH & Co. KG
Mittelstraße 8, 78532 Tuttlingen/Germany
Postfach 230, 78503 Tuttlingen/Germany
Phone: +49 (0)7461 708-0
Fax: +49 (0)7461 708-105
E-Mail: info@karlstorz.de
Web: www.karlstorz.com

KARL STORZ Endoscopy-America, Inc.
2151 East Grand Avenue
El Segundo, CA 90245-5017, USA
Phone: +1 424 218-8100,
+1 800 421-0837
Fax: +1 424 218-8526

KARL STORZ Endoscopy Canada Ltd.
2345 Argentia Road, Suite 100
Mississauga, Ontario L5N 8K4 Canada
Phone: +1 905 816-8100
+1 800 268-4880
Fax: +1 905 858-0933

KARL STORZ Endoscopia Latino-America, Inc.
815 N. W. 57th Avenue, Suite 480
Miami, FL 33126-2042, USA
Phone: +1 305 262-8980
Fax: +1 305 262-8986